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OF
LITERATURE AND SCIENCE,

PUBLISHED UNDER THE AUSPICES

OF THE

MADRAS LITERARY SOCIETY

AND

AUXILIARY OF THE ROYAL ASIATIC SOCIETY.

VOL. VI.

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No. 16.—*July,* 1837.

I.—*Notes on the Code and Historical MSS. of the Siamese and on the Progress of Buddhism to the Eastward.—By* Lieutenant T. J. Newbold, *Member of the Asiatic Societies of Madras and Bengal.*

With reference to the subjoined notes on the spread of Buddhism to the east, as connected with the notice of the Siamese MSS. lately presented to the Society, I will briefly state in explanation that, during a period of service in the Straits, my attention was powerfully attracted, by the prevalence of Hindu words in the construction of the language of the Malays, and in the names of places met with in their historical MSS., to a consideration of their literature, religion, and written character prior to the introduction of Mahomedanism.

From the almost total absence of records, among the Malays of the peninsula, anterior to this important era, I was compelled to seek their history through the medium of that of their neighbours, the Siamese —the Aborigines of the peninsula—the Javans, the Bugis, the Battaks, the inhabitants of Menangkábowe, and even from the Chinese. In the course of these enquiries, made, as opportunity offered, from natives of these countries themselves, the great prevalence and antiquity of the religion, and alleged similarity of the written language of the Buddhists of eastern and western Asia came under discussion. The result was an impression on my mind that Buddhism, propagated either from Ceylon or the continent of India (in a few instances supplanted by Brahminism), was originally engrafted on the rude, natural religion of the islanders, on the Sinterism of the people of Japan, the tenets of *Taon,* and the doctrines of Confucius in China—that the Sanscrit, prevailing in the dialects of the most civilized nations of the Archipelago, was introduced through the medium of the *Pali,* the language in which it appears the religious writings of Buddha were brought from

India, and in which Mr. Gutzláff lately heard the Buddhist priests, in one of the islands on the east coast of China, chant the sacred rites of this religion. The religion, language, and its written character will have doubtless suffered considerable change by coming in contact with those of the various nations among whom they have been transplanted, and that the *Páli,* or Sanscrit (as will probably be found the case with regard to the various dialects of peninsular India known under the Brahminical appellation, *Prácrit*) is not the root of the living languages of the Archipelago but merely a graft—as Arabic in the Persian, Malay and Hindustani, and Latin in our own language.

In order that these impressions might be corrected or confirmed by the written evidence of history, I resolved to procure copies of the most ancient annals, codes of laws, alphabets and written characters of the Ultra Gangetic nations, but before the collection had made much progress my Regiment was ordered to Madras. I feel convinced that a careful collation of the annals and sacred books of Burma, Siam, Khohman and Laos in the *Páli* dialects, and of Java and Bali in the *Káwi,* of the religious books and inscriptions of the Buddhists of China and Japan written in the sacred characters of the *Fan-yu** and *Bon-se* (supposed to be modifications of *Páli* derived from India) with those of Ceylon and Southern India, together with the opening of the hidden resources contained in the great native libraries, fac-similes of inscriptions of the Buddhists of *Magadha* and of the *Jainas* of the peninsula,† will by mutual illustration serve to shed considerable light over the chronology and history of India and eastern Asia, as well as to test the forgeries suspected to exist in the apocryphal writings of the Brahmins, and perhaps to solve the long contested point regarding the greater antiquity of the religion and language of the disciples of *Buddha* and *Brahma.* For this purpose the writings of the Brahminical philosophical schools might also be more minutely examined with advantage. Goverdhan Caul (who appears to have been of the Brahminical faith), in his article on the literature of the Hindus from the Sanscrit observes, "We need say no more of the heterodox writings, than that those on the religion and philosophy of *Buddha,* seem to be connected with some of the most curious parts of Asiatic history and contain, perhaps, all that could be found in the *Páli,* or *sacred language* of the Eastern Indian peninsula."

It is necessary to add that these speculations would not have been

* For the alphabet and specimens of the written characters of these languages I have already written : should they be procured copies, or the originals, shall be forwarded to the Society.

† Many valuable manuscripts on the religion of the *Jainas* collected by Mr. Wathen, are deposited in the library of the Bombay Literary Society ; still, I believe, awaiting translation.

obtruded in their present imperfect form, had not the interest lately excited among Indian *literati* towards the history of this singular and widely extended religion, as regards Ceylon and Southern India, by the announced publication of a translation of the Mahawanso and the promised opening of the Mackenzie MSS., led me to hope that their communication might perchance contribute to stimulate among the many highly talented sojourners in our settlements to the eastward, a corresponding enquiry into the ancient records of the Buddha priests of Japan—China—of the Indo Chinese nations, and of the aboriginal tribes of the Indian Archipelago, as they stand in relation to those of India and Ceylon. In this spirit the following notes are proffered. The inferences and quotations they contain are adduced rather with the view of courting investigation, than for the purpose of establishing a theory.

The historical records of Siam may be divided, like the nation itself, into two classes—the ancient and the comparatively modern. The *T'hay J'hay* and the *T'hay.* I am not aware that copies of the former have ever been procured by European collectors; though, from the testimony of Leyden, corroborated by that of several intelligent Siamese with whom I have had oral communication on the subject, there can be little doubt of their existence. According to La Loubére, who visited Siam in 1687-8, the *T'hay J'hay* or ancient nation of Siam was then in a state of barbarity compared with the more modern *T'hays.* Leyden distinctly states that they were formerly famous for their learning and the power of their empire, that many monuments of this ancient race still exist in the kingdom of Siam, and that in the vicinity of Ligore, there are various ancient inscriptions on stone, among the ruins of a very ancient temple, which are attributed to the *T'hay J'hays,* but which no person among the moderns was able to decipher. The annals of the *T'hay* dynasty, according to the same author, commence only from the building of the city *Maha Nakhon,* a little more than 1400 years ago. The ten volumes MS. now sent to the Society constitute a portion of this modern version, commencing in the 712th year of the Siamese era. The book of laws is a compend of the civil code of Siam; it is divided into two parts—the first comprises an introduction and a chapter containing 33 sections, embracing regulations for the protection of agriculturists, trespasses committed both by men and animals—stealing of rice, agricultural implements, water for purposes of irrigation, removing of land-marks, &c. Part the second contains 12 chapters with an introduction and preamble. It treats principally of the fines and punishments for making false claims to the property of others, pawns, mortgaged lands, water-rights, recording of deeds, the laws of borrowing, buying and selling, gambling, quarrels, the properly securing of elephants, cattle, &c. and concludes with a

chapter of regulations against sorcery, witchcraft, administering love philtres and potions, to cause madness or abortion, and against improper exposure of corpses. The leading feature in the land regulations is the right of the sovereign to all land; a law which appears to prevail almost universally both in the Malay peninsula and Indian Archipelago. In fact there appears to be a family resemblance in all these codes; which it would not be devoid of interest to trace to its source.

I shall endeavour to procure a copy of the more ancient records of Siam; which, it may be reasonably surmised, will throw much additional light on the obscurity that shrouds the origin of this singular nation, and on the introduction of the religion of *Buddha* into Siam; the history of which is intimately connected with that of almost every nation from the mouth of the Indus to the eastern confines of Asia. The Buddhism of Siam is said to resemble the form prevailing in Ceylon, more than the Buddhism of China, Tartary, Hindustan and Japan: but this point requires more careful consideration and analysis. It appears to be certain that both the Burmese and Siamese acknowledge to have received their religion from Ceylon, though it is probable the former received it through the ancient *Magas* or *Mughs* of Aracan. *Buddha* it is well known is supposed to have been born at *Cicatá*, a place said by the learned author of the *Bhagawatomarita* to have been a wood near *Gaya*, an ancient city of south Bahor or *Magadha* the kingdom of *Bali*, through which flows the river *Fulgo*,* supposed by Major Wilford to be the *Caenthis* of Arrian. The date of his birth or incarnation is fixed by Sir W. Jones at about 1,000 years† before Christ. Major Wilford informs‡ us that the ancient and most extensive empire *Magadha* was named from the families descended from the sage Maga, the offspring of the Sun and the grandson of the venerable *Twashtah* in the west, and who came into India in the time of Krishna, from these are sprung the *Magas* (or Mughs) of Bengal and Arracan. The old kings of *Magadha* gave great encouragement to learning, and it is said there were elaborate treatises on religion and almost every science in the *Magadhi Báli* or *Pali* dialects. Major Wilford it appears was not successful in his researches to obtain copies, which he supposes, if they do exist, are to be found among the followers of *Jaina*. The high degree of civilization and commercial influence of the empire of *Magadha* and the city of *Pali Putra*, the supposed *Palibothra* of Ptolemy, said by Diodorus Siculus to have been built by the Indian Hercules *Bala*, is attested by Arrian in his Periplus, and in the *Pentingerian* tables. Major Wilford mentions having seen an inscription in *Páli*, found in Bahar, written in the Burmah character, which

* As. Res. IX. page 32. † As. Res. II. page 125. ‡ As. Res. IX. page 74.

he was unable to decipher. According to Mr. H. T. Colebrooke,* the religious books of the Jains are written in the Prácrit called *Magadhi*, which he believes to be the *Páli* of Ceylon, and cites one of their works, the *Calpa Sútrá* composed about 1500 years ago, written in this language, observing that the Sanscrit language is used by the *Jainas* for translations or for commentaries, on account of the great obscurity of the Prácrit tongue.

Major Wilford with considerable ingenuity and much research traces the intercourse that formerly prevailed between Magadha, Nepal, Thibet and China. But the spread of Buddhism southerly to the peninsula of India and the island of Ceylon, is by no means satisfactorily elucidated. The translations of the Mackenzie MSS. and that of the *Mahawanso* will throw much light, it is to be expected, on this part of Indian history, as well as on the expedition of *Rama* and the expulsion of the *Jainas*, who are identified with the Buddhists. It is certain that at a very early period fierce disputes arose between them and the Brahmins, which terminated in the expulsion of the former from the shores of India. Many took refuge in Ceylon, and probably some few contrived to escape to Java, Sumatra and other islands to the eastward.

Date of Expulsion from India. The date of this event or events, as well as that of the expedition of *Ráma*, with which perhaps the first persecutions of the Buddhists by the Brahmins may be found to be connected (Hémachundra, an ancient Jain author enumerates among the nine foes of Vishnu the king of Lanca Rávaná, and the king of Magadha, Jará Sandha both probably worshippers of Buddha (As. Res. IX—316), are epochs, the fixing of which I take to be of considerable importance in Indian history. Their final expulsion from the Deccan was not effected, according to Mr. Chambers, until so late as the 9th or 12th century of the Christian era ; and, according to the Hindu author of a history of Cashmir translated by order of the emperor Akber, it was not till the reign of *Naikh* the 59th prince of Cashmir, that the Brahmins of Cashmir got the better of the followers of *Buddha* and burned down their temples. Dr. Francis Buchanan† fixes the reign of *Naikh* at about A. D. 342.

Arracan and Burma. We shall now attempt to trace this singular religion eastwards. It appears certain that the people inhabiting the countries immediately to the eastward of the empire of *Magadha* soon adopted the tenets of *Buddha*—among the rest the *Mughs* or *Magas* of Arracan ; from which nation, Buchanan is of opinion, the Burmese received their religion, laws, and government, about 600

* As. Res. IX. page 310.

† As. Res. VI. 165.—Mr. Colebrooke asserts (As. Res. IX. 294) that this passage cited by Dr. Buchanan is not supported by the Persian or Sanscrit text.

years ago; though by the Burmese themselves a much earlier date is ascribed to this event.* Buchanan himself admits that the Burma code, more than 600 years old, was introduced from Ceylon; and, according to their own chronological tables, procured by the late embassy, their first monarchs are said to have come† from Magadha, more than 300 years B. C.

Colonel Symes states, "As an incontestible proof that the Burmans acknowledge the superior antiquity of the Cingalese, and the reception of their religion and laws from that quarter, the king of Ava has sent, within these few years, at separate times, two messengers, persons of learning and respectability, to Ceylon, to procure the original books on which their tenets are founded; and in one instance the Burman minister made an official application to the Governor General of India to protect and assist the person charged with the commission." It seems a reasonable conclusion from the statements, as well as from what the Burmese themselves aver regarding the antiquity of their religion, that it originally came, before the Christian era, through Arracan, from the empire of *Magadha* direct—that on the decay of this Buddhist empire and ascendancy of the Brahmins, they were compelled on religious matters to communicate with Ceylon; the sanctity of which island must have been considerably increased by the influx of Buddhist priests from India.

Siam. The introduction of Buddhism into Siam, I am assured by several natives of that country, took place at a very remote period from Ceylon; these assertions are corroborated I find by their popular records, which are remarkably clear and decisive on this head; for instance‡, "Five hundred years after the decease of *Samono Godon* (Gaudama), there were three kings in the island of Ceylon, who, together with the *rahans* or priests, assembled to consult on matters of religion. One of the kings inquired, whether any person present had ever seen the deity during his life time. All replied in the negative. One of the *nâks*, knowing their conversation, instantly left his residence, came through the air, and presented himself in their assembly, saying, that he had seen the deity during his life time, and could create a perfect representation of him. This he accordingly did, and the kings and people sacrificed to it for seven days, and seven nights successively. The *nâk* then assumed a human form, and prostrated himself in humble adoration before the priests; after which he resumed his own nature and returned home, and with him disappeared his representation of the deity. But the kings, priests, and people

* As. Res. VI. p. 302. † Hamilton's Gazetteer—art. Ava.

‡ Chinese Repository, vol. IV. p. 177.

determined to make a brazen image of it. One of the workmen employed in casting the image, offended one of the kings, who struck him and wounded his forefinger. The power of fate following this act of the king, destroyed one of the fingers of the image. This king proposed to replace it, but one of the priests dissuaded him, and by his knowledge of futurity prophesied that at some future time the statue should be conveyed on the great sea (the bay of Bengal), to the extremity of its waters, where a great king should replace the deficient finger.

" In the year 700 of the Buddhist era, there was a mighty monarch governing Siam, whose capital was Soökcoty ; his fame extended from the Ganges to China, and from the extreme north to the ocean (gulf of Siam). He had heard of this famous image in Ceylon, and wished to sacrifice to it: and to effect this he employed the rajah of Ligore to send an embassy and beg it of the Ceylonese king. That king being reminded of the ancient prophecy consented. On the passage back, the ship was sunk, and all the seamen perished; but the image, possessed of *innate glory* (which is proved at large in the Buddhist books), floated towards the country of Ligore, seated on the back of the great ocean (bay of Bengal). The rajah, admonished of the fact by a *taywadah*, who appeared to him in a dream, sent vessels to receive it, and prepared a great abundance of offerings (which, after being presented, he was careful to take away). The image being so graciously received, made a display of its wonderful power, by rising of itself, and floating about in the air. Astonished at this, the rajah hastened to inform the monarch of Siam, who after innumerable offerings conveyed it to his capital." It may be remarked that the idol was received at Ligore, where mention is made by Leyden, of a very ancient temple alluded to in the early part of this note.

The Siamese, according to Leyden, have also traditions that their religion was introduced from Laos; but until the ancient records of this nation and of the *T'hay J'hay* tribe can be examined, we must be content with the inference that they were indebted for their religion to Ceylon, about the 2d century of the Christian era.

Laos, Cambodia, Cochin China, and Tonquin. Regarding its introduction into the countries lying between Siam and China, viz. Laos, Cambodia, Cochin China and Tonquin, little is known. The records and sacred languages of these singular countries, are yet *desiderata.* Leyden* states, that it is in the country of *Lân* or Laos, that all the celebrated founders of the religion of *Buddha* are represented to have left their most remarkable vestiges. *Ceylon* boasts of the sacred traces of the left foot of *Buddha,* on the top of the mountain *Amála-*

* Dissertation on the Languages and Literature of the Indo Chinese nations, p. 104.

Sri-padi, or Adam's Peak. *Siam* exhibits the traces of the right foot on the top of the golden mountain *Swa-na-bapato.* Other traces of the sacred steps, are sparingly scattered over *Pegu, Ava,* and *Arracan:* but it is among the *Laos,* that all the vestiges of the founders of this religion seem to be concentered—and whither devotees repair to worship at the traces of the sacred steps of *Pra-ku-ku-sôn, Pra-kôn-na-kôn, Pra-put-t'ha-kat-sop* and *Pra-sa-mût-ta-ko-dom.*

The description of Cambodia by a Chinese traveller, translated by Remusat, mentions the prevalence of three great religious sects there, viz. the *Chon-kon,* or Buddhists, the *Pan-ke,* or literary sect, and the *Taon-passe.* These would appear to correspond with the *San-kon* or three religions of China, viz. those of *Confucius, Buddha,* and that of the philosophers or heretics, as the disciples of *Laon-keun* are styled.

The city of Saigon in Cambodia, we are told by Lieut. White, of the American Navy, in his account of Cambodia, is crowded with temples dedicated to *Buddha* similar to the Chinese pagodas.

China. Sir Wm. Jones, in his seventh discourse, on the Chinese, states his opinion that the religion of Buddha or *Fo** was introduced into China from India in the first century of our era. Major Wilford with more minuteness fixes the date of its introduction in the year 65 A. C. This he does on the authority of Pliny, which amounts merely to the report of one of the four Cingalese ambassadors to the emperor Claudius, who began his reign in 44 A.D., that the *Seres* (Chinese?) lived beyond the Haimada or snowy mountains, and that they were often seen and visited by the Cingalese through commercial intercourse, and that whenever caravans from Ceylon went there, the *Seres* came in a friendly manner part of the way to meet them. Major Wilford thinks that there can be no doubt that the Cingalese went first by sea to the country of *Magadha* or the Gangetic provinces : where their legislator *Buddha* was born, and his religion flourished in the utmost splendour ; and thence, with the caravans of that country, to China, through the great route mentioned by Ptolemy from *Palibothra.* M. De Giugnes and others prove the subsequent intercourse prevailing between India and China.

As doubts have arisen, notwithstanding the authorities just adduced, regarding the introduction of Buddhism into China from India, we will hear what the Chinese themselves say on the subject. They constantly aver that *Froh* or *Buddha* came from the west. In the west they place his paradise. †The emperor *Ching-Tih,* who died A. D. 1520, meditated sending an ambassador with expensive presents to

* Mr. De Giugnes asserts on the authority of four Chinese historians that Fo was born 1027 years before Christ.

† Indo-Chinese Gleaner vol I. page 150.

India with the view of bringing the most learned of their Buddhist priests into China to explain more fully the original tenets of their sect, a purpose from which his minister *Wang-Yang-Ming*, who was a man of letters and a philosopher, attempted to dissuade him in an eloquent address, wherein allusion is made to the tenets of *Fuh* as a religion which had its origin in the distant countries of the west, and to *Fuh* himself as being the sacred sage of foreigners. It may be here remarked that the Chinese have no character whose initial sound corresponds with B; consequently their pronunciation of the word *Buddh* would be P'hudh, or *Fut, Fuh.* The emperor *Mingti,* who is supposed to have flourished during the first century after Christ, sent ambassadors into India, in consequence of a saying of Confucius, viz. that the most holy was to be found in the west, who returned with the books and doctrines of *Buddha.* These did not make much way against the doctrines of Confucius until about 518 A. D. when a Buddhist priest named Darma or D'herma (an Indian name) came into China from *Seitensku* which, says Kæmpfer, according to Japanese explanation, means, that part of the world which lies westwards of Japan. On the island of Honan there is a large Buddhist temple called the *Fut-kaon**, containing many inscriptions indicating the origin of their religion. For instance *Hoe-teen Fok-te* the "happy region near the sea." *Nam-teen-fut-kwok* "the nation of *Buddha* in the southern region."—*Hoe-van Poo-te* "the god *Buddha* on the shores of the sea." Three large images of the *Jam-pow-fut.* The three precious Buddhas, past, present, and future. In this temple there is a single image of *Amida* (immeasurable) *Buddha*; in Chinese called *O-mi-to-Fuh-ti.*

Corea.—Shortly after the appearance of the Buddhist priest *Darma* in China, Buddhism made rapid progress to the east.† The first idol to *Buddha* in the peninsula of *Fakkusai* or Corea was erected in 543 A. D.‡ Professor Wilson states the introduction of this religion into Corea to have taken place A. D. 530.

From Corea it may be traced to Japan and the Chusan group; one of which, the island of Poo-to, was visited lately by Mr. Gutzlaff the missionary.§ The immense number of Buddhist temples and priests, sixty two of the former and two thousand of the latter, on this small island, the area of which does not exceed 12 miles, can only be accounted for by supposing it to be a place of peculiar sanctity where *Buddha* is supposed to have first made his appearance. This is corroborated by the large inscriptions hewn in rocks of solid granite, and the many gigantic statues of Buddha. The highly picturesque

* Indo Chinese Gleaner vol. III. page 236.

† Kæmpfer.

‡ Preface to Sanscrit Dictionary.

§ Quarterly Review, vol. LI. page 475.

scenery of the* island itself, with its "many peaked, riven and detached rocks," and a stately mausoleum containing the bones and ashes of thousands of priests, are confessed by the worthy missionary to have totally bewildered his imagination. The vespers of the priests Mr. G. says were chanted in the *Páli* language, not unlike the Latin service of the Roman church. They held their rosaries in their hands, which rested folded upon their breasts; their service was regulated by the tinkling of a small bell, and they occasionally beat the drum and large bell to rouse *Buddha* to attend to their prayers.

Japan.—Buddhism can be traced distinctly from Corea to Japan (Niphon) in the† 6th century of the Christian era. According to the Japanese annals‡ in the year 552 A. D., the king of Fioksae in the west of Corea, sent an embassy to the *Daii kinméi*, with an image of *Buddha* and his classical books. Professor Wilson states that the year 572 was remarkable for the arrival in that kingdom of an immense number of priests and idols. The Japanese annals inform us that this religion, after having encountered some persecutions, soon triumphed: and that about A. D. 600, two zealots of great influence, one the cousin of the empress, built temples and invited priests from Corea. In A. D. 805, the *Darri kwanmu* caused idols of *Buddha*§ to be placed in the imperial palaces, and the sacred books procured from India to be read and explained in the temples.

The traditions of the Japanese, according to¶ Kæmpfer's Japanese author, relate that about a thousand years ago there was in *Tientensiku* (that is the middle *Tensiku*, whereby must be understood the country of the Malabarians and the coast of Coromandel in India) an eminent *fotoke* called *Mokuren* a disciple of Siaka (the Sacya of Sir W. Jones), and that about this time the idol of *Amida* (*Buddha*) appeared at a plain in Japan called *Naniwa* environed with golden rays.

In an extract from the Chinese work the *Chow-hoe-too-peen* we find, towards the close of the 14th century, that the emperor *Hung-woo* sent a Buddhist priest to Japan with a command for that nation to venerate Buddha.

Mr. Meylan, in his late publication on Japan, published at Amsterdam, states that the *Dairi* or spiritual emperor still allows strange gods to be imported from Siam or China.

* According to Japanese annals in the reign of the successor of the emperor Sensin, who died A. D. 70, a celebrated personage arrived from India riding on a white horse and bearing in his hands a sacred book.

† Chinese Repository, vol. III. page 158.

‡ The period in which the building of the Buddhist temples in Java commenced—Raffles's Java—vol. II. page 86.

§ Chinese Repository vol. III. page 203. ¶ History of Japan vol. I. p. 167.

Loochoo. We find from the Chinese official memoirs* concerning the Loochoos (published first in the reign of *Kang-ke*, about A. D. 1700 and extended to the 13th year of the reign of *Kew-king* A. D. 1808 printed at Pekin) that the people of the Loochoos are followers of *Buddha*, and that they say, about 1275 a Buddhist priest was driven on the island in a boat, whence he came they know not, and that they have had priests ever since. The priest was probably a native of Japan or Corea. Mr. Fisher, a late writer on Japan, saw at Nagasaki some Corean barks, which are occasionally driven on the southern coast of Japan, and it is not very improbable that some may have drifted so far south as the Loochoos.

Sumatra. Having thus far traced the progress of Buddhism from *Magadha* and Ceylon, over the southern regions of the continent of Asia to its most eastern confines, I will attempt to follow its track through the Indian Archipelago. Assuming that the Buddhists, at some very early period, were driven from the shores of peninsular India, it is very reasonable to suppose that many of them would take advantage of the numerous trading vessels lying in the southern harbours, and escape either to Ceylon, or seek a more distant and secure asylum in the ports to the eastward, with which it is a well authenticated fact they had long been in the habit of carrying on an extensive system of commerce. The first land of any importance made would be probably the Tenasserim coast, or the northern extremity of Sumatra, Achin ; and where the general prevalence of mutilated Hindu images is noticed by Sir S. Raffles (Memoirs page 384) ; whence it is fair to suppose that the prows of the refugees would be turned towards *Menangkâbowe*, a very ancient empire the capital of which, *Pagarnyong*, was situated in the heart of Sumatra, and the sway of which extended formerly over the whole of this large and fertile island. The literature, language, and the Buddhist images discovered by Lieutenant Crooke at Jambi, and the *Kawi* inscription in *Menangkâbowe* by Sir S. Raffles, go to bear out this notion. The Revd. W. Taylor, in some learned and obliging remarks on my brief note touching the *Batta* tribe, has fully established the identity with the Sanscrit *(Pàli ?)* of many words existing in the present languages of the neighbouring tribes of Battas. Lieutenant Crooke mentions the existence of a nation of idolaters, in the vicinity of *Jambi*, called the *Kúbus*†, subject to the sultan of Palembang. The strong inclination of many of these tribes in the interior to the doctrine of the metempsychosis (still partially entertained by the Malays both of Sumatra and the peninsula of Malacca), and the religious veneration in which they hold the names of their ancestors, are now the almost only indications of the tenets of *Buddha* which formerly prevailed to a certain extent.

* Indo-Chinese Gleaner, vol. II. page 9. † Appendix to Anderson's Mission, page 389.

Java. The fixing any date for the first introduction of Buddhism into Java must perhaps mainly depend upon that of the expulsion of the Buddhists from the peninsula of India by Brahminical persecution; without we entertain the supposition that this religion was in the first place introduced and taught by the early Buddhist traders from India or Siam, and afterwards established by the subsequent colonizations of the refugees. To the later settlers may be ascribed the erection of temples and idols to *Buddha* and the formation of a regular priesthood. The Javans we know, date the commencement of their era (A. D. 75) from the arrival in Java of a personage named *Adi-Saka* or rather *Saca,* which according to Sir Wm. Jones is a name for *Buddha,* and at all events is the title, according to Major Wilford,* of the six glorious monarchs, who gave rise to six subordinate periods, into which the Caliyuga is divided. The third of these, *Salivahana Saca* was born at *Sa'leya Dha'ra* in the Deccan, and established an era nearly corresponding to that of the Javanese *Saca,* and which is used by the Buddhists and natives of Southern India to this day. In a chronological work of the Javans, said to be written by *Aji Jáya Báya,* we are told that in the 10th year† of the Javan era 20,000 families were sent to Java by the prince of *Kaling* (or *Kalinga*) who prospered and multiplied. Most of the Buddhist temples in Java appear to have been built between the 11th and 14th centuries, corresponding with that ascribed to the final expulsion of Buddhism from India. From Java it may be traced eastward to the now Brahminical island of *Bali.* From those of *Lombok, Sumbawa, Flores* and *Timor* to the confines of New Guinea little is known. The vast unexplored island of Borneo is said to contain ruins of temples, in which are found inscriptions in characters unknown both to the natives of the island, the Chinese, and the Malays. In Celebes is said to exist an ancient and recondite language, like the *Páli* of the Siamese, or the *Káwi* of the Javans. Many of the best informed Pugis assert their Hindu origin, and their language bears evident traces of *Sanscrit* or *Páli.*

Whether it ever reached the Philippines is matter of doubt—the Spanish missionaries on the islands have, it is said, taken great pains to extirpate all the ancient records of the *Tagála* races, in which the history of their religion and the deeds of their heroes were celebrated in poems and songs.

Malay Peninsula. South of the Siamese provinces, few indications are found on the Malay peninsula of the Hinduism which is supposed by many intelligent Malays to have formed the religion of its chief princes, prior to the introduction of Islam, from which the commencement of the authentic history of the Malayan nation can alone be

* Chronology—Kings of Magadha. As. Res, IX. 83. † Raffles's Java vol. II. page 69.

dated. If reliance can be placed on the traditions of the Malays, they possessed religious books and a code of laws written in a character now unknown (probably a modification of the *Káwi*), of which the zeal of their Mahomedan converters have obliterated every vestige. The many Hindu words, in the body of the language, still in use, the frequent allusions in their popular historical romances and poems, to the Ramayana and Mahabharat, contribute to strengthen the plausibility of these traditions. It is certain that, at a very early period, a considerable intercourse subsisted between the peninsula of Malacca, India, and Siam. From one or both of these sources we must attribute the introduction of Hinduism or Buddhism.

In the *Sejára Maláyn* we are informed that *Raja Suran,* the monarch of *Amdam Nagara,* and founder of the city of *Bijanagar,** penetrated to the southern extremity of the peninsula, with an army amounting to one thousand and two lacs of men from the country of Kling (Kalinga), with an intention of invading China. He marched by *Perak* southerly to the country of *Glangkin,* which appears to have been formerly a great kingdom on the *Johore* river, where he defeated and slew its sovereign *Raja Chulan ;* who, according to the Malayan historians, was superior to all the *Rajas* of the countries lying under the wind. This kingdom was probably that of *Zabaje.* According to Major Wilford,† " In the peninsula of Malacca, was the famous emporium of *Zába : Zábája,* in Sanscrit, would signify those of *Zába.* The empire of Zábaje was thus called probably from its metropolis *Zaba,* as well as the principal islands near it. Zába was a famous emporium even as early as the time of Ptolemy. It remained so till the time of the two Musulman travellers of Remandot, and probably much longer. It is now called *Bátu Sábor,* on the river *Johore,* which is as large as the *Euphrates,* according to these two travellers ; who add that the town of *Calabar,* on the coast of Coromandel, and ten days to the south of *Madras,* belonged to the Máháràja of *Zabaje.*" The wars of this *Maharaja* with the king of *Al-Comr,* or countries near *Cape Comorin,* are mentioned by the two Musulman travellers, in the ninth century : and it seems that, at that time, the Malayan empire was in its greatest splendour. *Johore* in 1511 became the capital of a Musulman empire, but is now dwindled into a small fishing village. The chief still retains the title of sultan of *Johore.* It is in the vicinity of this place and the capital of Malacca that remains of the ancient religion, temples, sculptured inscriptions and idols, if they do exist at all, are to be looked for. Not far from the mouth of the *Johore* river, on the island of Singapore

* The present city of Bijanagar was founded in 1336 by two brothers named Aka Hurryhur and Bucca Hurryhur, on the traditional site of one still more ancient.

† As. Res. IX. page 39.

(*Singhapura*), near the point of the river, is a large stone bearing an inscription in a character which has hitherto, I believe, resisted the efforts of all decipherers, Sir Stamford Raffles among the rest.

At Malacca and the states in the interior my efforts were unavailing to procure a single inscription or sculpture, prior to Mahomedanism. My enquiries, not confined to the Malayan tribes, extended to the savage aborigines, inhabiting the wilds and forests of the peninsula, but not a vestige of Buddhism was to be traced—save their veneration for these ancestors, the partial belief of a state of future existence in the west, and the imperfect notions entertained by them of the metempsychosis.

Identity of the sacred language among the Buddhist nations of Eastern Asia. The *Káwi*, the sacred or poetical language of the Javans and Balinese, bears great affinity to the *Pali*. Most of the inscriptions found in the Buddhist temples of Java, their ancient religious works, poetical epitomes of the *Ramayana* and *Mahabharat*, are written in this language. The characters are square, many of them corresponding exactly with those of the *Pali* of Burma and Siam.* The knowledge of these ancient characters, like those of China and Japan, is confined to a few individuals. Some of the *Káwi* inscriptions, it is alleged by natives, go back as far as the beginning of the 6th century of Salivahana†, though Mr. Crawford contradicts this.

Sacred languages of the Buddhists of the Indo-Chinese kingdom. There appears to be little doubt that the sacred language of the Buddhists of *Magadha* and Ceylon, Burma and Siam, is essentially similar, though varying considerably in its written character. According to Major Wilford, *Magadha* and *Pali* or *Bali* are considered synonymous by the people of Siam, Ceylon, and Burma‡. Leyden and Kæmpfer inform us that among the Indo-Chinese nations the *Pali* is frequently denominated *Sanka-basa, Maccata-pasa* or *Magadhi-bhasa*, i. e. languages of Ceylon or *Magadha*, plainly indicating its origin. In Ceylon the terms *Magadhi* and *Pali* are both applied to it.

Sacred language of China and Japan. The sacred language of the Buddhists of China is termed the *Fan-yu*—the language of *Fan*, (India ?) where they suppose *Fuh* or *Buddha* was born. Having few books, particularly modern works on Chinese philology, to refer to, I do not know whether this language has ever been examined, or speci-

* Mr. Medhurst, when at *Sangora*, a Siamese town on the east coast of the Malay peninsula, wrote out the Japan alphabet for the Buddhist priests there, who were much struck with the great similarity existing between the characters composing it and their own. *Journal of a Voyage up the east coast of the Malay peninsula.*

† Crawford's Archipelago, vol. II. p. 213.

‡ Dissertation on the Languages and Literature of the Indo-Chinese nations, page 121.

mens of its written character given by European writers. If not, a notice of its construction, with an alphabet and vocabulary at the hands of any Chinese scholar, would be highly interesting, as well as of those of the *Bon-se*, the language and character in which the sacred writings of the Buddhists of Japan are written. It is probable they will both be found polysyllabic, and to bear great affinity to the *Pali* and *Magadha* languages of India, Ceylon and Siam, &c. Both the *Bon-se* and *Fan-yu* are unknown to the laity of China and Japan, and the written characters are said to be very dissimilar to those in common use. That of the *Fan-yu* is said by the Chinese* to have existed unchanged from the commencement of the world, as is the *Magadhi* by the Cingalese. The *Bon-se* of Japan is said to be of divine origin, and to have been first introduced from *Fiaksae*† in the west of Corea A. D. 552. The sacred books of *Buddha* were subsequently procured from India by the *Dairi-kwanum* in 805. Although the priests of China and Japan make use of these languages, in their idolatrous rites, I was assured by some Chinese officials at Malacca, that the *Fan-yu* was seldom understood even by the priests themselves, and this is probably the case with the *Bon-se* of the Japanese. The *Fan-yu* is no doubt the language in which Mr. Gutzlaff, the missionary, heard the Buddhist priests of the island of Poo-to, one of the Chusan group, chant their vespers, and which he states to have been in the *Páli* language.

Identity of Deity and Religion. The Burmese and Siamese worship *Buddha* under the names of *Gaudam* or *Gautama.* The Chinese under that of *Sheh-kea,* and the Japanese adore him under the appellation of *Saca* or *Sacya,* spelt by the Dutch *Siaca,* and by the Portuguese *Xaca.* The *Pirt* of the Siamese, the *Fuh* of the Chinese, and *Bodso* of the Japanese, are used as general terms for the deity among these nations, and are evidently corruptions of the word *Buddh* or *Buddha.*‡ The names given by the Hindu Buddhist§ *Amaracosha,* to the last supposed incarnation of *Buddha,* viz. *Sacya, Muni, Gautama,* &c. clearly identify him with the present *Sheh-kea* or *Sacya* of the Chinese and Japanese, and the *Gaudam* or *Gautama* of the Siamese, Cingalese, and Burmans. The identity of these deities is further proved by the testimony of Francis Buchanan, who saw the Chinese ambassadors worshipping the images of *Buddha,* at the capital of the Burmese empire, as if their own, and by that of a Chinese, long resident at Siam, who informed me there was but little difference in his religion, and that of the Siamese, and that they worship the same images.¶ The *Adi Saca*

* Indo-Chinese Gleaner, vol. III. p. 143. † Chinese Repository, vol. III. p. 203.

‡ For the explanation of the Chinese corruption *Fuh,* vide page 9.

§ As. Res. vol. II. page 123—4.

¶ Mr. Gutzlaff in his journal of a residence in Siam states, that he saw the Chinese make offerings to an idol of Buddha in a temple at *Kokram.*

of the Javans, who is supposed to have introduced a new form of letters and religion into Java A. D. 75, and from whose arrival on their island the Javans date their era, was probably a Buddhist priest of peculiar sanctity from India, cotemporary with *Salivahána Saca* himself, who flourished and introduced into India at this period the era of *Salivahána*, a name by which he was distinguished among the six Sacas, who give their names to the six periods, into which the *Caliyug* is divided. *Saca*, in Sanscrit, literally signifies an age or era; but, according to Wilford,* the six periods are called *sacas*, because they divide their origin from these six monarchs.

The leading doctrines of the metempsychosis, preservation of animal life, and of the *Nirvána*, or future state of rest, will be found to assimilate in these nations, and they all look forward to the advent of another and final appearance of *Buddha* upon earth. The Brahmins in a similar manner look forward to the accomplishment of the 9th and last *avatar* of *Vishnu*, viz. that of *Calci* who will appear, they say, for the destruction of all the impure with a cimeter like a blazing comet. The Buddhists of China believe *O-mi-to* (*Amida*) *Fuh* to have past, *Sheh-kea* (Sacya) *Fuh* to have last appeared, and *Me-lih Fuh* is yet to come.

It would not suit the limits I had set to this paper to enter into a critical examination of the differences existing in the metaphysics and external religious forms and observances of the Jainas of India and the Buddhists of Ceylon, the Indo-Chinese nations and China; suffice to observe that I consider them to have originally sprung from one source, and to express my conviction that a careful consideration of the various habits—the peculiar positions, geographical and political, the prior existing religions, and subsequent influential causes operating upon these nations, will serve in a great measure to account for the present variations. In all future researches into the dogmas of these sects, the *vivâ voce* evidence of the priests should be received with great caution, and checked by constant reference and comparison with that contained in their sacred books.

Ancient inscriptions should be collected and every precaution taken to secure *Buddha* MSS. free from Brahminical taint, written in the original *Pracrit* or *Páli*. A comparative view of Brahminical and Buddha chronology is still a desideratum. The genius of a Colebrooke itself was bewildered in the chaos of 2,000,000,000,000,000 oceans of years, contained in the *Avasarpini* and *Utsarpini* divisions of time.

* As. Res. vol. IX. page 83.

II.—*On the Language, Manners, and Rites, of the* Khoonds, *or* Khoi Jati, *of the Goomsoor Mountains; from documents furnished by* J. A. R. Stevenson, Esq. *Commissioner in Goomsoor, and* W. G. Maxwell, Esq., m. d.; *with Illustrative and connecting Observations. By* Reverend W. Taylor, *Member of the Madras Literary Society, &c.*

Previous to any other observations it may be desirable to settle the true name of the people who have been designated Khoonds. In the title to Mr. Stevenson's paper on their customs they are styled కోదులు *Codulu*, and in Dr. Maxwell's list *Khoi-jati*. If the orthography of the first written term be correct, as I presume it may be so considered, it must be a mistake to write the word Khoonds, intimating a transition through the Hindustani. The Telugu alphabet has a letter corresponding with *k'h*; but as it is not used in Mr. Stevenson's paper, the proper representative according to Sir W. Jones's orthographical system is *c.*; and as Dr. Maxwell only intends to give the sound, and probably made use of Hindustani as a medium of intercourse, his spelling does not necessarily militate against the same conclusion. The people I presume to be the same with those who have been otherwise termed *Goands*, usually classed as similar with the *B'heels.* There is besides a resemblance to the native term for the Coorg mountaineers, which is *Codugu;* and I am inclined to think, that any one who fully understood the Coorg dialect, could hold intercourse with the Khoonds. The insertion of the obscure nasal sound of *n* I may observe is no objection: it may be inserted or left out, in many Telugu words, and in some Tamil ones. *Codulu* is plural in Telugu, and *Codur*, would be the same in Tamil. If from deference to the usage, which has obtained, I use the term Khoonds, it is still improperly, and from a regard only to perspicuity.

The papers by Mr. Stevenson and Dr. Maxwell, in a loose and unarranged form, may, for order's sake, be classed under two heads, as relating to the language, and to the manners and rites, of this singular people.

On the language the vocabulary transmitted by Mr. Stevenson may be first inserted; because of the precision conveyed by the use of Telugu letters. The orthography by which they are represented is not systematic; but it may suffice. I am guided by the Telugu writing.

VOCABULARY.

	Khoond pronunciation in Teloogoo character.	
God	మహాప్రభూ	Mahaprabhoe
goddess	పెంన్నూ	pennoo
earth	టాంణా	taunah

water	కక్కెర్రీ - శిడ్రాజీ	kakary, sedrajee
name	పాదా	pautha
fire	టాణి	taunee
tree	మ్రుహాన్ను	mrahunnoo
village	నాజు	nauzoo
villages	నాసకా	nausakah
house	యిడ్డు	iddhoo
cows	కొడింగ్గా	codingah
goat	వొడ్డంగ్గా	voddungah
bullocks	బలదకొడ్డింగ్గా	balatha koddinga
buffaloes	తల్లికోరు	tullekoroo
birds	పొట్టాగ్గా	pottagah
animals	జొంత్తు	jontoo
tiger	క్రాడీ	kraudee
fowl	కొజ్జు	cozoo
sheep	మెండ్డా	mendah
mountain	సొరకా	sorakah
nullah or water course	జోడి	jodee
do. in plural	జొడింగ్గా	jodingah
river	నొయా	noyee
tank	బంద్దా	bundhah
paddy-field	కెత్తా	kettah
stone	బడ్డి	buddy
herds	కొడింగ్గా	kodingah
man	లోకో	loko

male	మ్రొణెజు	mronajoo
female	ఆసమ్రిడ్డా	ausamriddah
child	మిడ్డా	middah
mother	అయ్యా	ayah
father	అబ్బా	abbah
daughter	బుడ్డి	booddee
son	మ్రీంజు - ఆపో	mrinjoo, aupoe
daughter-in-law	కుడువా - జహారి	coodoova, jahary
son-in-law	జామా	zaumah
husband		
wife	హ్రావి	hramauvy
birth	గాడాజొనె	gaudajonay
life	నిబ్బామానె	nibbamanay
death	సాతె	sautay
marriage	బిహా	behah
gift	బిడ్డె	bidday
male-child	ఆపో	aupoe
female-child	ఆసామిడా	ausamiddah
big	ఠరారి	tharaury
how many	యెస్సె	yessay
do you know	పుంజ్జీ	poonjee
hallo	ఆడె	auday
head	త్లావు	tlavoo
hairs of the head	త్లావుత్లామెలకా	tlauvootlamalaka
eyes	కనకా	canakah

ears	క్రీవు	creevoo
nose	ముంగ్గలు	moongaloo
mouth	సుడ్డా	sooddah
teeth	పటకా	patakah
chin	టొడ్డాళి - సొడ్డాంగ్గా	toddaly, soddaunga
tongue	బంగోశి	bangosee
cheeks	గడ్డాగ్గా	guddauggah
moustache	శెరికోరాంగ్గా	serekoraungah
throat	డొక్కా - శెరికి	docka, sareky
shoulder	కందా - కగ్గు	cunda, cuggoo
hand	కజ్జు - కక్కా	cuzzoo, cuckah
arm	బాహా - మొపొకుట్టా	bahah, mopokoottah
elbow	కొహొణి - గాటి	cohony; gauty
hand	మడ్డా	muddah
finger	బసకాక - వొంగరి	basakaka, vonagary
nails	నొక్కొగ్గా	nockoggah
heart	మొనొన్నొ - జెడ్డా	monno-jeddah
breast, chest	బుఖ్ఖు	bookhoo
belly	టుూటుూ	tootoo
navel	పునెడ్డి	pooneddy
thigh	గొడ్డాగ్గా	goddauggah
calf of leg	సురడీ	soorady
leg	కటకా	catakah
feet	పాదాగ్గా pavoo	padaggah pavoo
back	గండీ	gundee

buttocks	గిజ్జా	ghizzah
curry	కుసా	coosah
rice	బాహా - పుల్లా	baha, pullah
afterwards	బాతో	batoe
before	నోయితో	noyeto
one side	పఖ్ఖా	puckhah
above	సెండోకి	sendoky
below	నెడ్డా	neddah
distant	ధూరా	dhoorah
dew	శరి	saree
falls	తీపికెమున్నె	theepekamunnay
so much	గుల్లె	goollay
paddy	కూడింగా	coodingah
rice	ప్రాంగా	praungah
paddy fields straw	పీరి	peeree
green gram, or pasaloo	మొగాగ్గా	mogaggah
Dholl or puppoo	జాయి	jayee
turmeric	సెణింగా	seningah
salt	సారు	sauroo
tamarind	నెడ్డి	neddy
chillie	ప్రితకావు	pretakavoo
ghee	ఘీహీ	gheehee
oil	నిజ్జూ	nizzoo
castor oil	గబ్బాగ్గా	gubbauggah
milk	పాడ్డు	pauddoo

curds	ధోయిగ్గా	dhoyeggah
wey, buttermilk	గోల్లో	golloe
fish	మినకా	menakah
flesh	వుంగ్గా	voongah
cloths	శిండ్డా	sindah
new	పూనారి	poonary
old	ప్రాడ్డారి	praddary
will you give	శియ్యాము	seyahmoo
take	వోము	vomoo
I will give	శియాయి	seyayee
I will take	వోయిమాయి	voyemayee
do not want	శిడ్డే - కోయె	sidday, coyay
I require	లోడామున్నే	lodamuñnay
onions	ప్యాజుకా	peyazookah
garlic	లెసుణికా	lasooneekah
unripe	శిడ్డారి	siddaree
ripe	శెణతారీ	sanataree
young fruit	కొగ్గారి	coggaree
leaf	ఆకా	aukah
a bough	డెట్టి	dettee
bud, blossoms	కోమలాకా	comalakah
wind	బిలీవు	belevoo
what	యింన్నా	innah
why	యింన్నాకి	innaky
will you come	బాయింజీగినా	bayinjeegeenah

come	బామూ	baumoo
are you going	సజీగినా	sajeegeenah
go	సలామూ	salamoo
don't go	కూనాసల్లా	coonasullah
be satisfied	సత్తాషామూ	suttashamoo
be happy	మంజాదుమూ	munjadoomoo
you will be ruined	బాసంగాది	bausungaudy
it will be good for you	నెగ్గారాది	neggaraudy
don't fear	అజ్జాఆ	azza-ah
weeping	డ్రీమంన్నె	dreemunnay
laughing	కక్కనారీ	cuckanary
talk	కత్తాచెస్తాము	cuttachastamoo
eat	తినుమూ	tenoomoo
drink	వునుము	voonoomoo
good	నెగ్గారి	neggaree
not good	వొదాయితారి	vodauyetaury
ask	జామూ	jaumoo
tell	బెసుమా	basoomah
I will tell	బెశిపింజాయి	baseepinjayee
do you understand	పుశి	poosee
I understand	పుశె	poosay
collect in one place	రోబాతా	robatah
friend	తోణె	tonay
	Mitto	mitto
dark	అద్దాంగ్గి	addaunghy

light	వూజ్జాడి	voozzady
break of day	బెళాతా	balatah
night	నాడాంగ్గి	nadanghee
sun	బెళా	balah
moon	దాంజు	daunjoo
stars	సుక్కాంగ్గా	soockaggah
morning	నాడి	naudee
midday	బెండా	bendah
evening	బిల్లాడి	billadee
tomorrow	బియె	beyay
day after tomorrow	మాంయిశి	mauyesy
yesterday	రియెశి	reyasy
day	నెంజు	nenzoo
month	ఆంజ్జో	aunjo
year	బొరసకా	borasakah
raining season	పిజ్జుదినా	pizzoodenah
cold season	పెన్నదినా	pennadenah
hot season	కరాదినా	caradenah
plural	దెహః	dahah
singular	రొండ్డె	ronday
wax	శిత్తా	sittah
honey	ఫుక్కి	phoocky
maiming	కత్తనా	cattanah
fly	బీసా	beesah
one	రొండ్డె	ronday

twenty	కోడకాత్తూ	codacauttoo
hundred	సోయకా	soyakah
two hundred	రీసో	Reeso
thousand	అజారకా	Azarakah
two thousand	రీఅజారా	ree azarah
small	కోగారి	cogaury

The first word is Sanscrit, with a dialectic termination. It means *great chief, prince,* or *lord,* from *mahat* great and *prab'hu* a lord, &c. and is so used in, I believe, all the dialects of Southern India. The second word is Tamil simply for a *woman* or *female,* in ordinary acceptation. The word for earth, is one designating place or locality ; and, derived from Sanscrit (if not adopted by it), runs through most of the Hindu languages, with dialectic variations. The word for fire, corresponds nearly with the Tamil தணல் *tanal,* great heat. The word for tree at first embarrassed me ; but it is evidently only a dialectic variation of the Tamil மரம் *maram,* a tree. The word for village is the Tamil நாடு *nádu,* properly country as distinguished from town, sometimes denoting a district, and in use nearly synonimous with village : the difference of *du* and *zu,* is merely dialectic. The plural form *kah,* besides differing little from the Tamil plural, *kal,* is further a close resemblance to the mode in which the plural is enunciated in the extreme south. The word for house varies very little from the Tamil வீடு *védu,* denoting the same thing. The word for cow has in it the Sanscrit root *go,* or *gau.* The term for goat is like the Telugu వేంట *venta,* a sheep or goat : it must I think be the same word. The word for birds, cutting off the plural termination, is the Telugu పెట్ట *petta* a bird. The next word for animal, is Sanscrit, Telugu, and Tamil, common I believe throughout India. For fowl the word is the Tamil, கோழி *corzi,* the Telugu letters expressing an imitation of the Tamil sound : the retaining this Tamil peculiarity is favourable to an inference as to the Tamil origin of the Khoonds. Mendah* for sheep is an intermediate sound between the Telugu వేంట *vénta,* and the Tamil மந்தை *mantai,* the former signifying a *sheep,* the latter more properly a *flock.* The word for mountain, is, setting aside the *kah,* apparently the Tamil சுரும்பு *surumpu,* or

* The *h* in this, or in the other words is not in the Telugu characters but simply long *á* as found in the word *after.*

of kindred origin. The term for river would seem to be only a dialectic variation of the Tamil நதி *nathi*, (*vulgó* nuddee, and nullah) a word which, coming from the Sanscrit, is found in all Hindu languages. The words for tank, stone, man, seem to come from the Hindustani, or possibly from the *Udiya* language of the province of Orissa. The word for mother is a slight variation from a Tamil word of like meaning, though now not much used. *Abba*, for father is found in Hebrew, Syriac, Telugu, Tamil, and in some of the dialects of the islands in the eastern archipelago; and is perhaps one of the most remarkable of all words. *Booddee* for daughter is the Sanscrit *putri*, slightly corrupted. *Aupoe* for son, is perhaps none other than the familiar domestic term of endearment அப்பாவு *appavu*, only used in addressing a male-child. కుడువ *coodoova* is the Telugu word కోడలు *codalu*, a daughter-in-law. The word for son-in-law seems merely a corruption of the Sanscrit *jamalu*, having the same meaning. *Behah* is also a mere dialectic variation from the Sanscrit *vivaha* marriage. The word for male-child is the same as the above for son, and the word for female-child may be a corruption of the Sanscrit *átmajà*, a daughter. *Yessay* for how many, is, I think, originally the same with the Tamil எத்தனை *yettani*, of the same meaning; த் and ச் or t and s, are frequently interchangeable in Tamil as in பெரிது, பெரிச great, பழுது, பழச old, சிறுது, சிறுச small, in which case *s* is the more rude, and *t* the more refined. *Tlavoo*, seems also to be originally the same word with the Tamil word தலை *tali* head. The word for eyes is Tamil, with a slight difference in the plural termination, as before noticed. The word for ear in Sanscrit is *srava*, in Telugu, *sevata*, in Tamil *sevi*, in the Todar dialect of the Neilgherries *kevi*, in the Khoond dialect, *crivu*, in Tamil the word *hearing* is கேள்வி *kelvi*, shewing that *s* is changeable into k, as is indeed the case with some other words. The natural conclusion is, that the whole of these words are dialectic variations from the Sanscrit *srava*, or conversely that the Sanscrit word was adopted from a common root; but I would not assert either conclusion. The word for nose is in Tamil மூக்கு *múccu*, or Telugu ముక్కు *muccu*. For teeth the Tamil word is பாகள் *parcal*, differing very little from the Khoond word. The Todars of the Neilgherries I am informed use the sound பாச்ச் *parch*, for tooth. The word for throat, *docka*, is used in Tamil to signify any hollow of a tube or pipe. The first of the two words for shoulder is the Sanscrit *scand'ha* having the

same meaning; and in Tamil, words from the Sanscrit, with the initial letters *sc*, usually lose the *s*, by which process the word would become *cand'ha*, or *canda*, as in the Khoond dialect. The word for hand seems to come from the very old Tamil *kayi* கயி, the modern spelling being கை *kai*. The யி by no unusual process is changed into சசு *chu*, whence the Khoond word *cuzzoo*, or as I should spell it *cajju*. The word *bahah*, is Sanscrit *báhu* the arm. The word for nails differs only slightly in its plural form (as before) from the Tamil நகஙகள *nacangal*, of the same meaning. The two words for heart, are, I doubt not, the same with மனம and சித்தம *manam*, and *sittam*, usually denoting the *mind* and *will*, but used interchangeably with இருதயம *irutayam*, *heart*, in the sense of will or inclination. *Padaggah* is only the Khoond plural added to the Sanscrit *pata* and Tamil பாதம *patam*, a foot. *Gundee* for the back is I believe the Tamil குண்டி *gundi*, the lower part of the back. The word for afterwards is probably Hindustani. The word for distant comes from the Sanscrit, and is common to all *Hindu* languages. In Tamil பிரி *piri*, and புரி *puri*, are used for a straw rope, and I doubt not that the same is meant by the Khoond, *peeree*. *Sauroo* for salt, is from the Sanscrit, *cshara*. In Tamil the word is usually combined with the common word for salt, to express the flavor or relish of salt. The word for chillie, differs only very slightly from the Telugu word for the same. *Nizzoo* is only the Tamil word நெயி *neyi*, the யி changed (as before) into *chu*, making *nejju*; but this in Tamil signifies ghee, or butter-oil. The word for fish, cutting off the Khoond plural, is the Sanscrit *min* and Tamil மீன *min*. *Poonary* for *new*, seems to be an antique word, preserved here and in the Tamil புனிறு *punirru*, the Tamil word being now only applied to the new birth from a cow. The word for old may have a connexion with the Tamil, but the resemblance is obscure. The word for garlic is Sanscrit, *lasuna*. *Aukah* for leaf is Telugu, ఆకు *acu*. The word for bud, blossoms, rejecting the Khoond plural, is Tamil குமிளி *cumili*, a bud. *Innah* for *what*, is the Tamil என்ன *yenna*, what? *Innaky*, for *why* is seemingly the Tamil என்னத்துக்கு *yennattuku* to what, why? In the phrase for *will you come?* the root of the verb *to come*, and the interrogating particle are both Tamil: the Tamil root is also found in the Khoond word *baumoo*, *come*. Salamoo, cutting off the Khoond termination, is

Sanscrit *sala*, to move, to go, it is corrupted both into Hindustani and Tamil. The word for don't fear seems to bear a relation to the Tamil அஞ்சாதே *anjaté*. The word for laughing is preserved in the Tamil phrase கக்கக்கென்று சிரிக்கிறான் he laughs uttering *cacac*, in the Telugu కకక్నావు *cacacnavu*, is a rude, or horse laugh; and a resemblance is also found in our common English, to *chuckle*. The phrase for talk is half Hindustani, half Telugu. *Tenoomoo* for *eat*, in the Tamil தின்னு *tinnu*, with the Khoond termination. *Voonoomoo* in like manner is the Tamil உண்ணு *unnu*, *eat* or *drink*. The word for tell is Telugu. *Tonay* for friend, is the Tamil துணை *tunai*, a friend, a prop. The other word is Sanscrit *mitra*,* a friend, it is adopted into Tamil, but most usually to signify treacherous friendship. The words for light, and break of day, have only an obscure resemblance to Tamil words of like meaning. For *night*, the word resembles the Tamil நத்தம் *nattam*, *night*. The word for stars rejecting the Khoond plural is Telugu చుక్క *succu* a star. The word for morning seems the same as the Telugu, నాడు *nadu* a day. *Borasaka*, for *year*, or, as I suppose, for *years* is no doubt, the Tamil வருஷம் *varusham*, a year. The three following words, for *hot*, *cold*, and *rainy season* seem to come from the Hindustani: the same remark applies to the word for *maiming*. The word for *hundred* seems to be a corruption of the Sanscrit word, that for *thousand* is I think the same as the Tamil ஆயிரம் *ayiram*, and for *two thousand*, a sort of bad pronunciation of the Tamil ஈராயிரம் *irayiram*, two thousand.

Such is the result of an investigation of the list of words, transmitted by Mr. Stevenson, expressly made the more minute, because both of the precision and check afforded by being written in Telugu characters: without these I should not have been able to give the words their proper enunciation, as the English orthography is not systematic and therefore uncertain. It must, however, be remembered that even the Telugu only gives the sound as conveyed to the ears of a comparative foreigner; though more likely to catch the true sound than an English ear. I suppose the mountaineers in question to have no written language.

From what has been stated, conclusions might be ventured; but it may be best to bring in further examples. The vocabulary of Dr. Maxwell has a somewhat larger number of words and phrases. It was accompanied by the following letter:

* It would have been desirable to give the Sanscrit in the original *Dêvanágari* characters, in the same way as the Tamil and Telugu characters are given. They were written in the copy; but omitted, I presume, through a want of that kind of type.
W. T.

To The Secretary to the Madras Literary Society.

&c. &c. &c.

Sir,—Any thing connected with the history of the tribes above the Goomsoor ranges of mountains, being interesting at the present moment, I beg to send you a list of Khond (or Ghond) words, which I collected whilst up there.

The Wodiah, I have also put down, which will render the list more interesting, and enable those, better qualified than myself, to make useful comparisons. To those passing through Wodiana into Khondistan this little list may also be of some service. I have only to regret that I cannot send you a more extended one.

I have the honor to be,

Sir,

Your obedient servant,

Samulcottah, *March* 15, 1837. W. G. Maxwell, m. d.

The Vocabulary is the following one :—

English.	*Woadiah.*	*Khond.*
one	ekke	ekke
two	doue	doue
three	tine	tine
four	chare	chare
five	panch	panchu
six	chau	sau
seven	sat	sathu
eight	ath	athu
nine	nau	nau
ten	dos	dosu
eleven	egarah	egara
twelve	barah	baarah
thirteen	terah	terah
fourteen	chaudah	saudah
fifteen	pundarah	pundarah
sixteen	solah	solah
seventeen	satarah	sataarah
eighteen	atarah	ataarah
nineteen	unis	unisi
twenty	kody	koze
a man	manusha	jama
woman	maikinya	asamida
boy	pua	apo
girl	ghia	bude
father	boppa	aba

mother	ma	aya
grandfather	bodda boppa	akenja
grandmother	bodda ma	atha
grandfather, mother's side	wodja	akey
elder brother	nunna	dada
younger brother	sana bhai	apo
elder sister	nanni	bhai
younger sister	bhouni	budi
what is your name?	tuora naum kiso	anni padatatti inu
where is your village?	toura gau koture utchi	mi naju embam unni
come early in the morning	boddu soccale aso	daasay vam *or* bam
how far is your village?	tuora gau kete door utchee	mi naju esse duro
my village is ten coss	humara gau dos kos utchee	mai naju dos kossu ane
how far is Patlingeah?	Patlinga kete dur utchi	Patlingaki essse dur ane
have you cooked food?	bhatta randuloki	veyha vasiti ginnaa
have you eat food?	bhatta khailoki	veyha tisi ginnaa
how many seers of rice did you eat?	kete ser chaulo bhatto khailo	pranga esse adiah tinge
I eat three seers of rice	tin ser chaulo bhatto khailu	tin adiah veyha tiee
do you eat meat?	Maunsa khailoki	inu onga tinji ginnaa
what meat will you eat?	tu ki maunsa khaibo	ani onga tinji
I will eat mutton	cheli maunsa khaibu	odu onga anu tiee
I will eat fowl	kukuda maunsa khaibu	kodju ongha tiee
I will eat fish	matcho khaibu	minu anu tiee
I will eat dry fish	sukwa matcho khaibu	nore minu tiee
I will eat pig's flesh	gusri maunsa khaibu	anu paji onga tiee
who is your God?	tumara kau Deybota	mindi anni peynu
what is his name?	tumara Deybota namo kiso	mi peynu anni peynu
how many gods have you?	tumara kete Deybota utchi	mi peynu esse peynu munne
Takurani is the greatest of all	samos teko bodda takurani	gulletiki dumalurri durani
how do you pray to the God?	ki mante Deybota puja korocho	peynuki singhi lakīderu
what is the name of this month?	ye masuro namo kiso	iree anni danju
February	Mhago	Keydu
how many people do you sacrifice in one month?	gute masure kete manuso katuso	oro danju esso anni mirimmi pakidirru
amongst the khonds how many castes?	khondare kete jati utchi	khoi jati esse jati munney

maliks	maliko	maliko
toddy dealers		sundee
cattle dealers		gouro
smiths		shouro
potters		comboro
basket-makers		dambo
weavers		panu
do you kill the women in your country ?	tumara gau re maikina ko mari pakawucha	mi naju tarrani asamidani pakadirganaa
yes they kill any person they can get	je milibo lukku marachu	esso anni paneru e anni paginirru
before killing how long are they kept ?	kariba agere ketedin rakucho	paginne veline esso dinno raigadirru
no time is fixed	ko dinno tikkana nein	denno tikna ate
in this month they sacrifice	ye masure sonki katucho	edanju marimmi paginirru
fire	nia	nari
ashes	karo	nari niju
charcoal	ongharo	1. nari sirovi 2. ongaranga
jungle	bono	gossa
tree	gotza	mhranu
chatty		tikki
dammer		saddali
fan	bichana	bichane
sun	korra	karra
moon	junno	danju
star	torra	sukkanga
cloud	megho	mudeng
rain	barrosa	piju
word, speech	kotha	katta
head	munda	tulao
nose	nakko	mungeli
mouth	sudda	suddo
lip upper		todde
lip lower		rapaddi
teeth	dant	patka
hair	bala	tala merka
breast	bukko	dukhi
belly	pettau	tutu
hand	katau	kadju
finger	angoti	vanju
nail	nakkau	ongoli
thumb	bodda angoti	darra vanju
foot	gaddu	kadu guttasi

knee	anthu	menda
leg	punda	pottu
eye	ankhi	kannu
ear	kanno	kirru
tongue	jibbo	wangosy
earth	matti	virra
stone	patro	vaddi
water	pani	1. sideru 2. sideruji
milk	palu	padu
salt	nuno	saru
leather	chummo	(gooroo) panda
battle-axe	tangi	tangi
cloth	lugga	sinda
brass-goglet		pida muta
marking-nut		gonje
gooseberry	aumla	zarga kanga
saber bean	chary gotza (tree)	pa erri (fruit)
horse	ghorra	ghora
leaf	puttera	akka
(mountain) indigo		vareda
beans of		vareyda guzerka
flowers of		vareyda poongha
I eat the flowers of M. I.		vareda poongha tinum
tree (bark of)		terasu mhranu
burra gotza	bodda gotza	darri mhranu
burra dez	bodda dez	muta khonda
what language do you speak ?	ki kotha koucho	anni katta vespimanjari
dubash	dobashi	dubassa
what business is the dubash's ?	dobashi ki, ki peyti wutchi	dubassa anni kabbari giajinaru
who went there now ?	yebbe kese golla ci battere	i pari imbai sajjumunni
what did you do with the cloth ?	ce lugga kaunokollo	e sinda anna gitti
I gave it to my wife to put on	humaro bhajoki pindibako dellu	mai kura nagulaimunni site tatite
give a seer of rice to that man	ce manusho ko sere chaulo de	e manaheniki pranga ade ka site
give a seer of rice to that woman	ce maikana ko sere chaula de	e asamida ade ka pranga sidu
give a seer of toor to that horse	ce ghorra ko sere khandulo de	e ghoratiki khanga ade ka sidoo

how many wives do the khonds take ?	khond jattire gutte jonon ke lutta vivaha utchi	koi jattiki esso unni vengha teru
do you smoke tobacco ?	tu dhua khao chuki	inu dhua undiginaa
do you eat tobacco ?	tu dhua tondere pakka utchi ki	inu dhua tinjiginaa
bring fire	nia ano	1. tammare nari 2. nari tummu
bring food	bhatta ano	tammare veyha
bring paddy	dhanno ano	tammare kodinga
bring rice	chaulo ano	pranga tammu
take away the fire	nia ne	nari om
take away the rice	bhatto ne	veyha om
take away the paddy	dhanno ne	kodinga om
father take away the paddy		kodinga ommare aba
bring the horse	ghorra ano	ghora tammu
bring the goat	cheli ano	oda tammu
kill the goat	cheli maru pukka	oda kattam
a kid	cheli pilla	oda mida
bring the cow	gai ano	koudi tammu
bring the calf	damri ano	dradu tammu
house	ghorre	iddu
is there any fire in your house ?	tumara ghorre bihtere nia watchiki	mi idduta nari munneginnaa
is there water in your house ?	tumara ghorre bihtere pani watchiki	mi idduta sideruji munneginnaa
how many people in your house ?	tumara ghorre kete jonon watchinti	mi idduta esse loku maneru
who cuts the wood to build the houses ?	ghorre bandibako katho ke dowatchi	iddu gariki vattiki vesca imbasianne
all the villagers cut	sub gaun lokko katti annile	gulle najutakka vesca kattinerru
what wood is that plank?	ce potta ki kotha	erri anne vesgu patta
mangoe	ambo katho	mha vesca patta
how many planks are got from one large mangoe tree ?	gutte ambo gotzeru kete potta barivo	erande mhranu essoni putta anu
two	Jure	joreka
terminalia bellerica fruit of		bare khanga
leaves of		bare aka
tree		bare mhranu
kernel		bare monzo
stone		bare palla
people eat the dry kernel		monzo gulla takka tinum
burra sahib		darre saib

maharaja		maparu maharaja raju
queen		mhade
toddy tree	sollupu gotza	sorta mhranu
comb	kangai or punya	sireni
go to that village and call a man	ce gaun ko jaikare gotte monushu ko dakiano	e naju sajane arkamu manheni erru anni arkam
will you go to Berhampore?	tu Berhamporko jiboki	inu Berhamporko sajiginaa
I will go	mu jibi	ana sagimai
I will come to-morrow morning	succalu asibi	daase vai
grass	ghasso	solah
long grass	nhoda	judah solah
basket	takkei	bogah
dammer tree	loringhi gotza	zirgi mhranu
dammer flowers		zirgi poongha
red	lall	inghu
black	kolla	kali
white	dhoba	longi
yellow	holidia	siningha
chair	kursi	(nō name)
bow	kando banso	viddu
kheli bow		kheli viddu
bamboo-bow		mari viddu
bow-string	gunno	viddu vessa
arrow	sorro	miliu
point		gouri mouari
barb	sorro charo	gouri kora
binding	loi	goha
notch	gunno jugga	tauni
feather	phonkhi	katka
quill	phonkhi	kedu
I am coming	mu asowatchi	anu idde vai
I am going	mu jaowatchi	anu sajimai
he is going	ce jaowatchi	yanjhu sajimunni
he is coming	ce asowatchi	yanjhu vai munni
we are coming	hum asowatchu	amu vanam
you are coming	tum asowatchu	eru vadu
they are coming	ye asowatchi	vaimanenju
I will go	mu jibi	anu sagimai
he will go	ce jibu	yanjhu sajimunni
we will go	hamen jibbu	amu sagimunnum
spirits	modda	kallu

they make toddy from the *Erpatree* flowers, &c.*	moulo gotzere teiaro koriba modda	erpi phoungha mhranuta kallu teiari gia manju
they put (the flowers and fruit ground small) into water for four or five days—and then boil—and then take off the spirit	(phullo phallo) chari panchi dini panire bottere rukhibo tein potche randibo tein potche moddo kari-bo	char panch din si-deruji itininju dau vajininni dau kallu ehe-neju
what is the use of the kissi tree?	kissi gotza ki peyti ki asowathci	kissi mhranu anni veygierru
we use the bark to make strings	lohi douri pain noutchu	amu nossu doruki vattiki onum†

After making out the list of words and questions, I took every opportunity of interrogating any Khond whom I met, and it was amusing to see his astonishment when I spoke to him.

On returning to the low country the only Khonds I met with, were some young children that had been preserved from sacrifice by the Collector. To one of these I addressed myself, asking his name in Khonds; speaking fast, at first he did not understand me, but on pronouncing more slowly and distinctly, he instantly called out his name.

In the preceding vocabulary the numerals are derived from the Sanscrit: the Tamil numerals are quite different. Some few of the words have been explained in Mr. Stevenson's list. In the rest there is a tolerable sprinkling of words, which are synonimous with Telugu or Tamil words. The *Udiya* dialect is seen at a glance, to be derived from the *Mágadha*, or Bengal and Bahar dialects, if not from the Hindustani, to which it has a frequent resemblance, sometimes amounting to identity. But I look upon the *Udiya* (or Wodiah) to be more modern than the Khoond speech. The word for milk may be noted as being in Udiya, the same as in Telugu, and nearly the same as in Tamil, while *Pádú*, as the Khoonds have it, shews a variation, which would give a different sense in Tamil; and yet it is probable that the word in all three dialects is originally the same. It will not perhaps be expected, and I know not that it would answer any really valuable object, to pursue as minute an examination with this list as with that of Mr. Stevenson. It may suffice to say that the same general result is indicated; which is, that the Khoonds have words peculiar to themselves, and others which are found in the low-land languages of the peninsula.

* *Bassia longifolia.*

† The diacritical vowel-marks employed by Dr. Maxwell are omitted in the printing, and by consequence his glossary of them; probably from the want of types with such marks. This explanation is given that Dr. M. may not consider his directions to be neglected. W. T

Before proceeding I must premise, for the information of some readers, that it has been a question among learned Orientalists, whether the refined Sanscrit was the parent of the common Hindi, the latter being a corruption, or whether the Hindi formed the basis or substratum of a common Indian language, adopted by the *Brahmans* on their entry into Hindustan, but polished by improvements and enriched by the addition of scientific and other terms, especially astrological ones, brought with them on their emigration. Perhaps from acquired partiality to the Sanscrit, there has been, with scholars in that language, a tendency to adopt the first supposition, just as there was with the same individuals a disposition to consider Telugu and Tamil as derived languages from the Sanscrit. But the erroneous character of this last deduction, reflects a doubt on the other part of the supposition as regards the *Hindi*; and I confess that when reading Mr. Colebrooke, in particular, the proof which he brought to bear in favour of Sanscrit being the original, and *Hindi* the derivative, produced in my own mind a strong doubt on that side of the question; while his admission of existing difficulties as insuperable on that hypothesis seemed to me to argue in favour of *Hindi* being the parent, and Sanscrit the polished, improved, and enriched, derivative. The very meaning of the term Sanscrit, implying *finished, polished, perfected,* argues towards the same conclusion. Even so our present polished English language, must be considered as founded on the Saxon; it would be absurd for any foreigner to term the old Saxon an early corruption of the original polished English. That view of the case which considers the Sanscrit to be a learned refinement on ruder dialects, if correct, leads to connection with another opinion, one that is likely to have strengthening evidence constantly added to it, which is, that there was one original *substratum* of an early and rude language, running through the whole of *Hindustan* and the peninsula; broken by time and distance into local dialects, which however still retain a strong affinity with each other. Such being supposed to be the case, is the Khoond dialect a relic of that common language, somewhat modified by time? or has it been made up by intercourse with people speaking the different languages, that have been discovered to exist, as if naturalised in the Khoond dialect? I am not able to determine either way; but, with some allowance for the latter source, in some cases, I incline rather towards the former view of the subject. I have read in some publication, concerning the Khoonds, that they have among them a tradition of having emigrated from the south, and from some mountain termed by them *Dodah*. This was the cause of my conjecturing some connexion with the mountaineers of the Neilgherries, whose highest mountain is *Dodabet*, and whose chief people

are the *Todars.* The comparison* of language however, so far as I have been able to effect it, has not much assisted any such conclusion. The Khoonds have words which are of antique, pure, and high Tamil ; such words are favourable to an ancient origin of their tongue. If at an early period they were driven to take refuge in mountain-fastnesses, by reason of nomadic hordes of foreigners taking possession of the low-lands, then they might very probably carry with them the ancient general dialect of the low country. I have some reasons for such an opinion, founded on documents not yet before the public ; but the most I can here do is to throw out the question for further consideration and investigation.

The second topic of attention is the manners, and rites, of this singular people. A brief extract from Mr. Stevenson's letter to the Editor of this Journal may perhaps best introduce this part of the subject.

" I must quite give up all hopes of being able to compile anything connected with the Khonds, &c. I have in vain attempted to find time to translate the enclosed memorandum, which are answers to queries put from time to time by me : you will have no difficulty in getting them translated,and if worth anything they can be made use of— the small *Vocabulary* is, I think correct—the account of the Merria or human sacrifice is also correct—but this I gave to Mr. Russell with a request that if he did not wish to incorporate it in his Report he would send it to you. If you think it worth while you might procure his consent to publishing it---to which, as he has finished his report, he would not probably object. The form of oath in their own language is curious and striking—these notes may assist you, or others who have collected materials, in drawing up a short memoir."

The memorandum to which Mr. Stevenson alludes, is a Telugu paper, rather in a Cutcherry hand-writing. It illustrates some of the curious peculiarities of the Khoonds. I have made with some care, and here present the following

(TRANSLATION).

The customs of the race of people called Codulu.

1. *The mode of celebrating marriages.*—Some of the relatives of

* After the above had been forwarded to the Editor of this Journal, that gentleman was so kind as to send me the first part of a Vocabulary by Reverend B. Schmid of the language of the Todars and Burghers (or rather *Vadagars*) of the Neilgherries. The perusal did not add much to resemblances of the Khoond dialect, but the materials on either hand are not full. The Todar language has some few Tamil roots, the Burgher dialect is full of Tamil words. The Todar dialect indicates great antiquity, and derivation, I am almost positive, from the Canarese, probably Hala Kanada.—The speech of the Vadagars (or northerns ?) is much more modern—that word at Madras designates the people of Telingana ; but being merely a relative term, it may have been used to designate a people who emigrated from some district, or country, north only of the Neilgherries. W. T.

the intended bridegroom, go to the house of the future bride, and ask if it be agreeable to give their daughter in marriage to the person indicated. If agreeable to the latter persons, they signify their consent; and they give a she-buffalo to the persons who came to make the demand. On the road back, they kill this animal, slightly roast it, and eat it. The following day the people of the intended bride's family go to see the purposed bridegroom: on which occasion the relatives of the latter shew every thing contained in their dwelling, or possession, to the visitors. Whatsoever these find to be valuable, be it a cow, or any thing else, they desire that it may be given to them; and they receive a promise that it shall be given, though it is not allowable then to receive and take it away: they feast on ardent spirits and flesh, and then depart. The next day the relatives of the man, call together a few other people; and the whole proceed, carrying the cow, and other things, to be given as requested. The people of the woman's family kill a number of buffaloes, proportioned to the visitors; on half the flesh of which the whole feast together, while the other half is carried back by the visitors, and made to feast all their relatives. Another time, the man's relatives proceed to the other house, and give them a formal invitation. On the female's relatives going accordingly, the people of the man's house kill buffaloes, eating one half together, and giving the other half, with rice, to the visitors, who carry the same back, and with it feast their relations.

Subsequently, the mother and father of the man, go to the other house, and ask when it will be agreeable to the female's relatives, that they should come to escort the female; and when any day whatsoever* is fixed upon, the precise place where the parties are to meet is specified. At this visit free use is made of spirits and flesh, before the visitors depart.

On the appointed day, mats† are laid down for the bride to walk over, and spreading a mat over her for the sake of shade, they give to her all needful household stuff, or utensils; and, accompanied by a crowd of men and women, they go a short distance in procession to the place previously indicated. The mother, father, and relatives of the man, remain previously a little farther off. The people of the female convoy, call out to the others to come and fetch the bride; and then a mock fight, with stones and thorny brambles, is begun by the female convoy against the parties composing the other one. In the midst of

* A negligence of auspicious, or inauspicious, days (according to *Hindu* notions) is implied by the Hindu writer of the original paper.

† The Hindus have a similar custom at their *funerals*, only they spread cloths instead of mats.

the beating, the assaulted party take possession of the bride, and all the furniture brought with her; and carry all off together. The female's relatives return from that place to their dwelling. The day following this transaction the man's relatives locate the female, and the furniture brought with her in the inner open court of their house. Subsequently placing her on a stool, they pour water over her head in bathing. Beneath this stool, the younger sisters or younger brothers of the bridegroom are concealed; and the water flows down over them. They take occasion, during the bathing, to snatch off the ring, from the bridegroom's finger. On her asking to receive back her ring, they strip off from one of themselves some valuable ornament, and give it to her, retaining the ring. Soon after, their hierophant (*Jáni*) comes bringing with him a cord,* a turmeric rod, also a nut of the tree *mesua ferrea*, which he strings upon the cord, and taking these things together with the bride and bridegroom only, he goes into the woods, where a hut, made only of sticks has been before prepared, in which being seated, the *Jáni* wishes them both health and domestic prosperity, and ties the cords* on the neck of each one. Afterwards they return to the house. Hogs and other animals are killed, and liquors brought, when they prepare *báji* (supposed from the use of the word in another place to be a sort of olio, or mixed dish) and all partake of it. From this day forward, the parties are considered to be man and wife. They beat on drums; they give to the *Jáni*, rice, flesh, and liquor, and send him away.

2. *The ceremonies attendant on the birth of a child.*—As soon as a child is born, they follow the ancient custom (not explained). For a month after the birth the mother does not eat out of the household vessels. On the day which completes the month, they kill some animal, and prepare the flesh, they also procure liquor, and make *bàji*. The victuals is cooked by the mother of the child. They pour a small quantity of liquor out upon the ground (as a libation) saying, "O beneficent goddess! preserve the child." They then distribute portions of prepared food and *curries* to the houses of their various relations. Those immediately belonging to the house, consume as much liquor as they please, and make *báji;* (here the word seems to denote a riotous banquet, or a feast).

Six months after, on a fixed day, they make *Gáduthuvà* (supposed to mean the same as *Námacarma*, or ceremony of naming the child). On that day killing a hog, and procuring liquor, they make *báji*. They wash the feet of the child. The *Jáni* being come, he ties a cord from the haft to the point of a sickle; they divine by means of it. Having

* The original is followed; the composition of which is not very exact in the use of singular and plural.

assembled the *Petrilu* (literally ancestors, but here denoting household images, or gods) they put rice on the sickle. As the names (of the ancestors? or family?) are repeated in order, each time the rice is put on, that name is chosen on the mention of which the sickle moves, and is given to the child. They then drink liquors, and eat *báji*. They give rice and flesh to the *Jáni*.

When two years are elapsed, they cut off the child's hair, and on that occasion, killing some animal, and procuring liquor, they make *báji*.

3. *The ceremonies customary at funerals.*—On the life ceasing, they tie a sheep to the foot of the corpse. They carry the clothes, brass eating-dish, brass drinking-vessel, ornaments, grain in store, and the said sheep, all together to the burning-ground. Having burned the body, and gone round about the pile, they leave all those things there, and beating drums, return home. Those garments the *Pánó** take away. They procure liquor, and drink it. They then go to their respective houses and eat. On the next day, they kill a she-buffalo, and get together a great quantity of liquor. The whole of the tribe (near and distant relations) being assembled, they make *baji*, and eat: they beat the drum (or drums). If the deceased were of any consequence, dancers come, and dance to the sound of their drums; to whom some animal is given, which they take and go away. Subsequently on the twelfth-day, they carry a hog to the spot where the body was burned; and after perambulating the site of the pyre, return to their home; where they kill the hog in the place set apart for their household gods; and procuring liquor, they make *báji*; the members of the tribe eating together.

4. *Case of death by a tiger.*—Should a tiger carry off any one, they throw out of doors all the (preserved) flesh belonging to him, and all the people of the village, not excepting children, quit their homes. The *Jáni* being come, with two rods of the *tummèca* tree (*Tamil—Véla maram*) he plants these in the earth; and then bringing one rod of the *Conda-támara* tree, he places it transversely across the other two. The *Jáni*, performing some incantation, sprinkles water on them. Beginning with the children, as these and the people pass through the passage so formed, the *Jáni* sprinkles water on them all. Afterwards the whole of them go to their houses, without looking behind them.

5. (*Degraded occupations*).—The *Mangili* (barber) *Pánò, Hadi, Dandási*, these castes, being excepted, the *Codulu* people eat with all the other tribes.

6. (*Treatment of Brahmans*).—The *Codulu* people do not pardon the *Brahmans* (or show them favour beyond others).

* Weavers.—Dr. Maxwell's vocabulary.

7. *The castes* (or tribes) *of the Mountaineers.*

1.	Codulu	7.	Gaudd'ha	13.	Cheduvà
2.	Páno	8.	Cumari (potters)	14.	Vódià
3.	Hadi	9.	Sudbà	15.	B'hadálà
4.	Chittra	10.	Gaudu	16.	Béniyà
5.	Lóhárá	11.	Tòmla	17.	Vómayattá
6.	Gunnà	12.	C'hadbà	18.	Sodi.

These tribes are in the mountains.

8. *The gods honoured by the Codulu people.*—1. Dherma dévata. 2. Savuri-pennuga, a forest-goddess. 3. Jácari-pennuga, a local goddess. 4. Járápennu, so called a *Linga dévata,* which is their favorite deity. 5. Jurachi-pennuga, the god or goddess of rain. 6. Tada-pennuga, the earth-goddess.

9. *The manner of worshipping these deities:* 1. If occasion arise to present any offering to *Dherma-devata,* they take inferior rice and mingling turmeric with it, they hold it up, and worship.

2. To *Savuri-pennuga,* the so-called forest deity, when the corn flourishes, they bring liquor, fowls, rice, and roasting the fowl, they cause worship (*puja*) to be made by the *Jani,* and preparing *báji* they eat.

3. To represent *Jacari-pennuga,* the local deity, they fix three or four stones, and near to these (representatives) they place dressed dolls, artificial figures of birds on sticks. On the beginning of any thing, or affair, or any particular occasion, they call for the *Jani* and slaying fowls and hogs, they bring liquor and making *baji,* eat.

4. To represent *Jara-pennu,* the *Linga-daveta* or the *Petri-devata,* they make, in brass, figures of elephants, peacocks, dolls, fishes, these and the like, and keep them in their houses. If affliction happen to any one belonging to the household, or if the country cutaneous eruptions break out on any of them, or if the anniversary of an ancestor's death occur, they put rice into milk, and mingling turmeric with it, they sprinkle the mixture on those images, and killing fowls and sheep, they cause worship to be made by the *Jani*; and, making *baji,* eat.

5. For *Jurachi-pennu* the rain-deity, if there be no rain, they kill a sheep beneath a tree, and causing worship (*puja*) to be made by the *Jani,* they cook half the flesh for the *Jani,* and cause him to eat, and the other half they divide among themselves.

6. To *Tádá,* the *B'hu-devata,* or deity of the earth, they make the *merria*-sacrifice, or offering. This *puja* having been finished, they give from one to three pecks *(tumu* or *maracal)* of grain, rice, a fowl, a sheep, (or fowls and sheep) to the *Jani* (or sacrificer).

I may add as regards the name adverted to at the commencement of this digest, that the hand writing sometimes leaves it uncertain whether the word by which they are designated should be *Cádulu,* or *Codulu,* but from the way in which the ఽ is sometimes written, I think it is not meant to be introduced into the word, which is I believe *Codalu ;* but I make the remark that I may not wilfully lead into error. I am not sure if the she-buffalo often mentioned may not be *a cow ;* which, however, a Hindu would not like to acknowledge. As to the term *Baji* it is to me unintelligible. But I think the term may receive some illustration from a passage which I extract from an account of a visit to the Raj-mehal hills near Bhaugulpore in Upper Hindustan. It is the following :

" At 11 A. M. we set off to visit the neighbouring villages. On reaching the former (Dundah-goddah) we found the inhabitants of both villages assembled for pooja and drinking.—Nearly all the people, to the amount of at least 100, were in a state of intoxication. The noise of the drums, cymbals and singing almost prevented us from hearing our own voices. We witnessed the Pooja which had just commenced, —a fowl and a pig were sacrificed, and a part of the blood of the latter, mixed with cooked grain and tuddee, drank by the Daimno." It is this last preparation which seems to me to harmonize with the way in which *Báji* is spoken of sometimes as a compound-food, sometimes as a feast. I may remark that I have met with the above extract since making the translation, consequently this was in no way influenced thereby. The *Daimno* of the Raj-mehal people is apparently the *Jani* of the Khoonds, and it seems to me that there is a close similarity between the customs of the two sets of mountaineers. Several coincidences appear in the account whence the above extract is made. I have otherwise heard that the hill people of Raj-mehal speak a language like Tamil. The name for village in the above extract *goddah,* or *gudi,* is perfectly common in the south, and in parts of Mysore. Any similarity of languages between insulated localities, so distant from each other, argues in favour of an early general language throughout India.

In the translated paper there are some things that appear otherwise curious, as the pouring out libations, a custom so familiar to the classic scholar ; and an almost universal custom of heathen antiquity. The placing sticks and causing people to pass under, or through them, reminds one of the *Furca* of the Romans ; though the import of the act in either case differs. However not to dwell on such things, nor on resemblances to customs heretofore among the South-sea-islanders, we may advance to that sacrifice which is briefly alluded to at the close, the *merria* sacrifice, on that of a human victim. This custom also pre-

vailed in the South-sea islands; and I cannot think that the many resemblances are perfectly accidental.

Of the *Merria* or human sacrifices, the following has been forwarded by Mr. Stevenson, alluded to in the extract from his letter :—

Memorandum regarding Human Sacrifices among the Khoonds.— The sacrifice is offered to Thadha deveta (the earth), under the effigy of a bird. It is offered annually to propitiate the deity to grant favourable crops and seasons. The ceremony is performed at the expense, in rotation, of certain Mootas composing a circle, and connected together from local circumstances. It is impossible to ascertain the number of places in which the annual sacrifices take place, but they are very numerous. Besides the annual sacrifice, human victims are offered up by Mootas, or by individuals, to avert any threatening calamity arising from sickness, murrain, or other causes. The victims may be of any caste, or sex, or age; (I have not however heard of an instance of Khonds being sacrificed) : but grown males are the most esteemed, because the most costly. Children are purchased, and reared for years with the family of the person who ultimately devotes them to sacrifice, when circumstances demand a victim from him. They appear to be treated with every kindness, and, if too young to be conscious of their fate, are under no constraint—otherwise they are kept in fetters and guarded. There appears to be no difficulty in procuring victims; most of those that have been rescued were sold by their parents or nearest relatives, and this appears a very common practice. Persons of riper age are kidnapped, and there are individuals who follow a trade in human flesh, and supply victims by kidnapping or forcibly seizing children. The Khonds never sacrifice a criminal, or a prisoner captured in war. It must always be purchased—the price paid is from 60 to 200 Rupees, and the price is paid either in brass vessels, cattle, or coin, or partly in each.

The Janee or priest (who may be of any caste) officiates at the sacrifice, but he performs the *pooja* offering of incense, flowers, &c. to the idol, through the medium of the Toomba, who must be a Khond child under seven years of age. This child is fed and clothed at the public expense, and eats with no other person, and is not subjected to any act deemed impure.

For a month prior to the day of sacrifice, there is much feasting, intoxication and dancing round the victim, who is adorned with garlands, &c. and, the day prior to the sacrifice, is intoxicated with toddy, and made to sit, (if necessary tied with seven ropes) at the bottom of a post which has previously been planted with some ceremonies, and on the

top of which is an effigy of a bird, and at the foot of which a brass figure of the same bird is buried. The Khonds and others dance round the post to music, and addressing the earth, say, "O god! we sacrifice to you, give us good crops and seasons and health." Then the victim is addressed—"We have bought you with a price, not seized you, and now sacrifice you according to custom. No sin rests on us." On the following day the victim is intoxicated with toddy again, and anointed with oil. Each individual present touches the anointed part, and wipes the oil on his own head. They then proceed in procession around the village and its boundaries, bearing the victim, who is preceded by music and a long pole to the top of which is attached tufts of peacocks' feathers. On returning to the post, which is always placed near the village deity (*Gram devete*), here called "*Jakaree penoo*," represented by three stones, and near to which the brass effigy of a bird, before alluded to, intended to represent a peacock, is always buried. They proceed to dig a pit, and having killed in sacrifice a hog, the blood is allowed to flow into the pit. The victim, who, if it has been found possible, has been made senseless from intoxication, is seized by five or six persons, thrown into the pit, and his face kept pressed to the earth, till suffocated in the bloody mire. All cries, if any, are drowned by the noises of instruments. When supposed to be dead, the Janee cuts a bit of flesh from the body, and buries it with ceremony near the effigy and village idol, as an offering to the earth; all present then cut pieces of flesh and carry it to their own villages, where part is buried before the same idols, and morsels in the boundaries of the villages, or fields, to which it is carried in procession, with music, &c. The head and face remains untouched, and when the bones are deprived of flesh, they are buried with the head in the pit.

Subsequently to this horrid rite, a calf is brought before the post, and his four feet being cut off, it is left there till the following day, when women, dressed in male attire, and armed as men, drink, and dance, and sing round the post. The calf is then killed and eaten, and the Janee dismissed with a present of rice, and a hog or calf.

Captain Millar (43d Regiment N. I.) when at Coopautee, managed with much discretion to rescue no less than twelve victims; seventeen more have fallen into my hands, making in all twenty-nine. The first who made her escape to my camp, although closely fettered, disappeared after a few days, and I could never learn more of her. She was an elderly woman; of the remainder, ten were restored to their friends, and eighteen children from three to ten years of age, remain with Captain Millar and myself. These were all sold by their parents, or I have been unable to discover their history and origin.

This account differs in some particulars from other accounts which have been published. There may, however, be different modes followed: this account may be considered to be authentic.

The remaining documents to be adduced are two forms of oaths. The one alluded to by Mr. Stevenson is the following :—

Form of Oath.

1. A blood-sucker,
2. A bit of tiger's skin,
3. Peacock's feather,
4. Earth from the white-ants' hill,
5. Rice mixed with fowl's blood,
6. A lighted lamp.

The substance of the circumstance is first repeated by the swearing party, and a basket containing the following things being held before him, he proceeds with his oath, touching each object in the basket at that part of the oath which refers to that object :— the blood-sucker, the tiger-skin, &c.

"Oh father (god!) I swear, and if I swear falsely then, oh father! may I become shrivelled and dry like a blood-sucker, and thus die; may I be killed and eaten by a tiger resembling this blood-sucker, may I crumble to dust like this white-ants' hill, may I be blown about like this feather, may I be extinguished like this lamp."

In saying the last words he puts a few grains of the rice in his mouth, and blows out the lamp, and the basket with its contents is made to touch the top of his head.

Yeree ubba,	hahumoo,	hurrudda,	attamo,	mi,	dosha,	shiddee
Oh Father	I	Oath	take	by me	fault	if is

yera,	neekee	surruda suttumo	Yeree ubba.
on	that account	to me and mine	oh Father.

Ghoe, dingee,	Bassee, Bassee,	Sunnummoo.
blood-sucker like,	dry and shrivelled,	may I die.

Ghoyee, dingee,	Khradee hanee	nangee	yesta challa	tinee
A blood-sucker like,	a tiger may come	me	having killed	eat

Beera, dingee	Mhaihe	hanai.	Mendoo, kuttaka
white-ant hill-like	crumble away	may I come.	Peacock, feather

hanai	yengae sahe	yenjoo	dippo	dingee	yengee
may I be	blown away	this	lamp	like	this manner

nimee	mammo.
may I be,	extinguished.

The other form, of a special character, is as follows :

Oath taken by the chiefs of the Mootahs of Rottungen, and Chinungea, on the occasion of the settlement of a boundary dispute, which had been for many years the cause of war between the two districts.

" The dispute which has existed between us so long is now decided—we will forget it and remain in peace, and hold our lands according to the limits laid down. Whichever party acts otherwise, and causes disputes again to arise, let him be reduced to dust, and his race and name become unknown."

The parties administered the oath to each other, holding over the head of the swearing party a basket of the soil, whilst he repeated the words of the oath.

Such are the materials which I have endeavoured so to digest as to place them in a somewhat clear and intelligible order. I do not know that any remarks of mine, whether laboured, or otherwise, could add to the deep but melancholy interest, which these documents are calculated to excite. It is quite clear that these people are not Hindus ; though a few ideas may have been borrowed from the latter. The Khoonds are clearly in a state next to entire barbarism. I am told that people from the north speak of the *khoi*-mountaineers as wild, deformed, and of vindictive character ; so much so, that it is not safe to speak to one of them, as a real or imaginary affront is never forgiven, but if possible is avenged with blood. They are also said to be potent in the use of charms, and incantations ; but these may be idle tales. One cannot, however, but remark their dissolute and drunken habits, as in most semi-barbarous people ; a description of vice usually leading to vindictiveness, ferocity, and bloodshedding. And when ferocity and murder become parts of a people's religion, every thing else may be expected that is degrading to human nature. Philanthropists have a new field opened for their exertions ; and I would, with pleasure, anticipate the time when they may become a Christianized, civilized, humane, and respectable, people.

I have to solicit indulgence for any possible faults, that may have inadvertently entered into these observations, which have been prepared amidst many other, and very dissimilar, occupations.

[The foregoing article, based principally on information communicated by the late lamented Commissioner in Goomsoor, will, independent of its intrinsic value, be read with lively, yet melancholy interest, as a posthumous relic of one, who, to the infinite regret of his many friends, and great loss of the Government, whose upright and talented functionary he was, has been cut off in the prime of life, and in the midst of a career which must have proved eminently useful to the country, as well as highly honourable to himself.—*Editor.*]

III—*Abstract of Eight Months' Meteorological Observations at Moulmein.—By* JAMES DALMAHOY, Esq. *of the Madras Medical Establishment. Physician to His Highness the Rajah of Travancore.*

The accompanying tables furnish a few data respecting the periodical oscillations of the barometer, and the heating power of the sun's rays at a station within the tropics. They contain also some other observations usually supposed to be connected with the movements of the barometer. As they refer to a period of eight months only, no general conclusions regarding the climate can be deduced from them, and therefore it was thought unnecessary to give a mean at the foot of each column.

Moulmein or Maulamyne, the principal station in the Tenasserim provinces, is situated in 16° 30′ N. L. and I believe about 97° 30′ E. L. It may be considered at the level of the sea, for the river, on the bank of which it lies, has free communication with the sea not eight miles to the westward, besides its more distant mouth at Amherst to the south. The observations were made at the height of thirty or forty feet above the surface of the river.

The barometer employed was a portable one of the syphon kind, and therefore required no correction except the reduction of the observations to a common temperature. The sound produced by striking the mercury against the top of the tube indicated that there was no air interposed. In making the observations, precautions were used to obviate the effects of friction between the tube and mercury. The barometer, also the wet-bulb thermometer, and one exactly similar for ascertaining the temperature of the air, were made by Mr. Robinson, of London. The thermometers were graduated to quarters of a degree of Fahrenheit's scale. The maximum and minimum thermometers were made by Mr. Adie, of Edinburgh, whose plan of introducing naphtha, above the mercury, in the former instrument, is completely successful in preventing the retraction of the index. The actinometer,* an instrument invented by Sir J. Herschel, was made by Mr. Robinson. It was observed only at apparent noon, and the glass plate in front of the bulb was always placed at right angles to the direction of the sun's rays. In making an observation, a board, just sufficient to intercept the direct rays of the sun, was held at some distance by an assistant, and the rise of the instrument during one minute was noted; the board was then suddenly withdrawn, and the rise during an equal interval again noted; the rays being once more intercepted, an observation similar

* See Reports of the British Association, &c. vol. ii. p. 379.

to the first was repeated. The quantity recorded in the table is the excess of the second of these observations above the mean of the first and third. The photometer was a portable one with the usual glass screen, and was procured from Professor Leslie's own maker in Edinburgh. The observations with it were made in the following manner. The instrument was exposed so as already to have attained its maximum at apparent noon. The direct rays of the sun were then suddenly cut off, and the degrees lost during *half* a minute were numbered and recorded. This method of using the photometer was suggested by the principle on which the observations with the actinometer are made. The rain was received in a tin vessel having its aperture horizontal and of known area. The water was then measured, and it was easy to observe the quantity of it corresponding to the thousandth of an inch in depth. Merely a thread and feather were used to shew the direction of the wind, and its velocity was only estimated by the help of a scale given in the appendix to Dr. T. Young's Lectures. The velocity recorded is the mean of the separate estimated velocities. Professor Forbes* has recommended the adoption of Lambert's method of registering the direction of the wind. According to this the south was denoted by 0° S. W. by 45° W. by 90° and so round the whole horizon. But to this plan it is a weighty objection, though apparently overlooked, that if the wind be registered as varying between S. W. and S. E. or between W. and E. always going round by S. the result will erroneously represent the mean direction of the wind to have been from the N.

Remarks on the Tables.

In table I, under the head thermometer, is given the mean minimum and mean maximum temperature; also the mean at $9\frac{1}{2}$ A. M. and $9\frac{1}{2}$ P. M. as these two latter periods divided nearly equally the intervals between the periods of least and greatest temperature, the mean temperature of the month is deduced from the observations at all the four. The time of maximum temperature seemed to be between two and three P. M.; it was sometimes hastened by the early setting in of the sea breeze.

The hygrometric state of the air was determined by Leslie's method, the mean temperature of his dew-point and corresponding tension of vapour having been deduced from the mean temperature of the air, and mean temperature of the wet-bulb thermometer. I am aware that the tension of vapour corresponding to the mean temperature of the dew-point is a little less than the mean tension, but the difference can seldom exceed what is due to two or three tenths of a degree of Fahrenheit's thermometer. The column marked dampness, gives the

* Reports of the British Association, &c. vol. i. p. 249.

quotient arising from the division of the number expressing the tension of vapour at the mean temperature of the dew-point, by that expressing the similar tension at the mean temperature of the air. The sixth or last column, under the head hygrometer, affords, in connexion with table II. data for calculating the amount of evaporation.

With respect to the quantity of rain recorded in the table, it is less than what usually falls during the corresponding period. The average annual fall of rain at Moulmein is above two hundred inches. Formulæ have been given for finding the mean fall of rain at any latitude, but it cannot be doubted that besides the distance of a station from the equator, its distance from the coast, the direction of the line of coast, the relative positions of the sea and land with respect to that line, and probably many other circumstances unite in influencing the amount of rain.

The times for recording the barometer were selected as furnishing its two maximum and one of its minimum heights. It did not appear however, that there would have been any sensible difference between the mean of the observations at $9\frac{1}{2}$ P. M. and $10\frac{1}{2}$ P. M. A comparison of the consecutive monthly differences of the barometer at the three daily periods of observation shews that, at each of these, the column of mercury decreased without intermission from January to June inclusive; in July, it again increased a little. The fall of the barometer may possibly have been caused by the shifting of the prevailing winds from the N. E. and N. W. to the W., S. W. and S. as indicated by table II., but there is nothing either in this, or the first table, to account for the increase of pressure in July.

With regard to the daily oscillations of the barometer, their magnitude is undoubtedly affected by local causes, but these latter ought perhaps only to be regarded as accidental disturbances of those general and constant causes on which the oscillations themselves depend. It appears, from the table, that both of the oscillations recorded increased from January until the end of March, and then diminished: in other words that though, as has been observed, the mean height of the barometer decreased, from month to month, at each of the three periods of the day, its decrease at $3\frac{1}{2}$ P. M. was more rapid, until the end of March, than at $9\frac{1}{2}$ A. M. and $10\frac{1}{2}$ P. M. The oscillations at a given latitude are supposed by M. Bouvard to vary in magnitude directly with the temperature, on the centigrade scale, of the period during which they occur. Is it not possible that they may also vary with the tension of the atmospheric vapour? It will be observed, on reference to the table, that this tension was greater at $9\frac{1}{2}$ A. M. and $9\frac{1}{2}$ P. M. than at $3\frac{1}{2}$ P. M. from February to May inclusive, while on the contrary it was less during January, June and July.

Professor Forbes* from a comparison of most of the recorded observations, has deduced a formula for finding the mean oscillation between 10 A. M. and 4 P. M. at any given latitude. The result of this for latitude 16° 30′ is 2.35 millimetres or 0.092 of an inch. The mean of the observations in the table cannot be considered the experimental mean at Moulmein, for, three out of the four unrecorded months being rainy, the former would almost certainly exceed the latter. The mean of 0.133 the greatest and of 0,077 the least quantities in the table, equal to 0.105, is probably very near the true mean. The difference between this and the result of the formula is a less fraction of the whole oscillation than occurs in a similar comparison in lat. 56° between the result of the formula and the mean of Professor Forbes's own observations; the errors in the two cases are however of opposite kinds.

The manner in which the observations in table III. were made, has been already noticed. The calculated altitudes of the sun at the period of the first observation on 7th January, and at that of the last on 30th April, were respectively 51° and 88° 17'. Supposing the atmosphere equally pervious, the ratio of the intensity at the former angle to that at the latter, is theoretically a little greater than 9-tenths, a ratio approaching much nearer to equality than it would have done if the altitudes had been smaller with the same common difference. It is remarkable that on the 14th January the photometer indicated 37, the greatest intensity recorded, and on the following day 32, the only other observation as great as the latter of these having been on the 30th April. It suggested itself to me at one time as probable that the apparent effect of the sun's rays might be influenced by the temperature of the instrument employed to measure it, but there can be no doubt that this and every other disturbing cause is excluded in the results obtained by means of the actinometer. The varying quantity of undissolved vapour lying in the path of the rays, offers perhaps the best explanation of the anomalous variations in their intensity, as was suggested by Dr. Richardson in explanation of the apparently great power of the sun's rays at Fort Franklin. Successive strata of thin vapour at a great height, may be conceived to intercept many of the heating rays, without causing a diminution of transparency sensible to the eye.

I regret extremely that the tables contain no observations on terrestrial radiation at night. The method of using the actinometer in the measurement of solar radiation, as already described, is applicable also to terrestrial radiation. Of course in this case the glass plate between the bulb of the instrument and the sky would need to be removed: it would also be necessary to lengthen the time of observation, and,

* Transactions of the Royal Society of Edinburgh, vol. xii.

in order to admit of comparison with other experiments, it ought further to be determined to what portion of the whole heavens, and in what direction, the instrument was exposed. It may be remarked that the method of measuring the intensity of terrestrial radiation by the maximum difference between the shaded and exposed thermometers is subject even to greater error than in the case of solar radiation, for it is evident, from the extremely heavy dew on a clear night, that the whole surface of the ground attains the temperature of the dew-point, and hence a detached thermometer must sink below it. But as soon as this happens, the decrement of temperature can no longer be a measure of the intensity of radiation in the same sense it was before, for there is now a continual influx of heat to the bulb from the condensing vapour. It might easily be shewn by the same process of reasoning employed to establish the dew-point formula, that if the tension of vapour corresponding to the minimum temperature of the exposed thermometer, be subtracted from the tension of vapour at the dew-point, and the difference be multiplied by 87, this product will express the additional number of degrees, on Fahrenheit's scale, which the exposed thermometer would sink, were it not for the dew.

P. S.—I venture to add, in a postscript, a few remarks which, while they are not altogether foreign to the subject of this paper, are not worthy of a separate place.

It is sometimes required to determine the internal diameter of a barometer tube when circumstances prevent its direct measurement. As this method of doing so, though easily derived from an elementary optical proposition, may not immediately suggest itself to those having only accidental occasion for it, it is here annexed. Apply the points of a pair of compasses to the external surface of the tube, and holding the eye opposite to them, and as far removed as is consistent with distinct vision, measure the least distance between the parallel sides of the bore. Two-thirds of this quantity is nearly equal to the true internal diameter. A nearer value is obtained by the following rule: add to the external diameter of the tube twice the distance of the eye from one of the points of the compasses, and divide by twice the distance of the eye; the product of this quantity into the approximate value already found, is very nearly equal to the internal diameter of the tube. When the external diameter is .333 of an inch, the apparent internal diameter .12 of an inch, and the distance of the eye 4 inches, the results of the two foregoing approximations, and of an exact calculation give, respectively, as the values of the internal diameter, .08 of an inch, .0833 and .08367.

TABLE I.—ABSTRACT OF METEOROLOGICAL OBSERVATIONS MADE

Year.	Month.	Barometer. Mean at $9\frac{1}{2}$ A. M.	Barometer. Mean at $3\frac{1}{2}$ P. M.	Barometer. Mean at $10\frac{1}{2}$ P. M.	Barometer. Mean depression between $9\frac{1}{2}$ A. M. and $3\frac{1}{2}$ P. M.	Barometer. Mean elevation between $3\frac{1}{2}$ P. M. and $10\frac{1}{2}$ P. M.	Thermometer. Mean at $9\frac{1}{2}$ A. M.	Thermometer. Mean at $9\frac{1}{2}$ P. M.	Thermometer. Mean minimum.	Thermometer. Mean maximum.	Thermometer. Mean temperature.	Thermometer. Mean daily range of temperature.	Hygrometer at. Mean of the wet bulb thermometer.	Hygrometer at. Mean difference between the dry and wet thermometer.	Hygrometer at. Calculated mean temperature of the dew-point.	Hygrometer at. Tension of vapour at the mean temperature of the dew-poi nt.
1835	Dec.	29.990	29.877		0.113		72.85	73.28	66.65	81.7	73.62	15.05				
1836	Jan.	29·990	29.869	29.942	0.121	0.073	70.4	71.0	65.3	80.0	71.67	14.7	64.6	5.8	61.1	0.543
,,	Feb.	29.966	29.839	29.918	0.127	0.079	71.75	72.6	65.8	82.6	73.19	16.8	67.43	4.32	65.1	0.619
,,	Mar.	29.936	29.803	29.898	0.133	0.095	77.5	77.0	71.85	85.0	77.84	13.15	72.5	5.0	70.2	0.734
,,	April	29·881	29.756	29.834	0.125	0.078	81.7	80.57	76.35	88.8	81.85	12.45	76.38	5.32	74.2	0.832
,,	May	29.827	29.717	29.795	0.110	0.078	78.6	78.15	74.65	83.3	78.67	8.65	75.6	0.0	74.3	0.835
,,	June	29·768	29.690	29.756	0.078	0.066	77.86	77.07	74.55	81.0	77.62	6.45	75.55	2.31	74.6	0.843
,,	July	29.803	29.726	29.797	0.077	0.071	77.1	76.2	73.8	80.45	76.89	6.65	75.1	2.0	74.25	0.834

NOTE.—The mercurial column in the barometer is reduced to 32 Fahr. The evening observations mission of nine days occurred in all the observations of May, with the exception of those on the quan

URING A PERIOD OF EIGHT MONTHS, AT MOULMEIN.

. M.	Hygrometer at $3\frac{1}{2}$ P. M.						Hygrometer at $9\frac{1}{2}$ P. M.						Pluviometer.			
Difference between the tension of vapour at the mean temperature of the air and of the dew-point.	Mean of the wet bulb thermometer.	Mean difference between the dry and wet thermometer.	Calculated mean temperature of the dew-point.	Tension of vapour at the meam temperature of the dew-point.	Mean dampness, saturated being = 1.	Difference between the tension of vapour at the mean temperature of the air and of the dew-point.	Mean of the wet bulb thermometer.	Mean difference between the dry and wet thermometer.	Calculated mean temperature of the dew-point.	Tension of vapour at the mean temperature of the dew-point.	Mean dampness, saturated being = 1.	Difference between the tension of vapour at the mean temperature of the air and of the dew-point.	Fall of rain in inches between 6 A. M. and 6 P. M.	Fall of rain in inches between 6 P. M. and 6 A. M.	Fall of rain during the 24 hours.	Number of times on which fog was observed before 9 A. M.
															0.5	2
0.194	68.8	10.7	62.9	0.576	.584	0.409	65.0	6.0	61.4	0.548	.730	0.202	0	0	0	9
0.150	70.13	11.6	64.0	0.597	.565	0.460	67.6	5.0	64.9	0.615	.777	0.176	0	0	0	16
0.192	73.58	10.69	68.6	0.694	.605	0.453	72.25	4.75	69.9	0.724	.798	0.184	0	0	0	13
0.224	76.36	11.74	71.3	0.758	.588	0.532	76.08	4.49	74.0	0.827	·810	0.193	0	0.103	0.103	3
0.121	76.2	6.0	73.7	0.819	.763	0.255	75.15	3.0	73.9	0.824	.872	0.121	8.896	17.494	26.390	0
0.093	76.44	3.76	74.9	0.851	.844	0.157	75.22	1.85	74.4	0.838	.919	0.073	17.671	14.691	32.362	0
0.079	75.8	3.5	74.4	0.838	.853	0.143	74.4	1.8	73.6	0.817	.921	0.070	8.303	16.669	24.972	0

f e barometer were made during January at $9\frac{1}{2}$ P. M. during the other months at $10\frac{1}{2}$ P, M. An inter-
t f rain.

TABLE II.—*Shewing the direction and estimated velocity of the wind.*

		N.		N. E.		E.		S. E.		S.		S. W.		W.		N. W.		Calm.
1836		No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.	Aver. velocity.	No. of obsns.
Jan.	9½ A.M.	1	4.	20	4.5	3	5.	7	6.	0	0	0	0	0	0	0	0	0
	3½ P.M.	0	0	1	5.	0	0	1	6.	0	0	2	5.	2	3.	25	3.5	0
	9½ P.M.	1	1.	14	2.5	1	2.	0	0	6	2.	5	1.75	0	0	0	0	4
Feb.	9½ A.M.	3	4.5	20	3.	2	3.5	4	5.	0	0	0	0	0	0	0	0	0
	3½ P.M.	0	0	0	0	0	0	0	0	1	8.	3	5.	12	5.5	13	4.	0
	9½ P.M.	0	0	2	1.	0	0	0	0	12	3.	14	2.75	0	0	0	0	1
Mar	9½ A.M.	2	3.5	17	3.	0	0	0	0	1	1.	7	3.	2	3.	0	0	1
	3½ P.M.	0	0	0	0	0	0	0	0	0	0	5	8.	24	6.25	2	5.	0
	9½ P.M.	1	1.	5	4.25	2	3.	0	0	10	3.	12	3.75	0	0	0	0	1
Apr.	9½ A.M.	1	3.	1	1.	1	1.	0	0	2	4.	6	4.	13	2.5	2	2.	1
	3½ P.M.	0	0	0	0	0	0	0	0	1	6.	16	8.25	12	9.	1	10.	0
	9½ P.M.	0	0	0	0	0	0	0	0	6	4.	22	5.	2	3.	0	0	0
May	9½ A.M.	1	1.	1	3.	3	1.	3	2.5	3	5.	2	2.5	6	1.5	0	0	4
	3½ P.M.	0	0	0	0	0	0	0	0	7	4.75	8	6.	6	5.25	0	0	0
	9½ P.M.	0	0	0	0	1	1.	3	3.	6	3.75	6	5.25	2	3.5	0	0	3
June	9½ A.M.	0	0	2	2.	2	2.5	2	3.	7	1.5	4	2.	3	1.5	0	0	8
	3½ P.M.	0	0	0	0	0	0	1	6.	10	4.75	12	4.	5	3.75	0	0	2
	9½ P.M.	1	2.	0	0	2	2.	2	3.5	5	3.	0	0	3	2.25	0	0	17
July	9½ A.M.	1	2.	2	2.5	0	0	2	2.5	7	1.25	4	2.75	6	2.	1	3.	8
	3½ P.M.	0	0	0	0	0	0	0	0	4	4.5	12	5.	10	3.	1	2.	4
	9½ P.M.	1	1.	2	2.	1	1.	4	1.75	3	3.25	5	3.	1	1.	1	4.	13

Note.—In the above table the velocity of the wind is expressed in miles per hour, but merely by estimate.

TABLE III.—*Shewing the heating power of the Sun's rays at apparent noon.*

1836.	Date.	Photometer.	1836.	Date.	Actinometer.	Photometer.	1836.	Date.	Actinometer.	Photometer.
Jan.	7	24	Feb.	20	10.5	24	March	30	9.25	22
	8	30		22	11.25	28		31	10.5	23
	9	30		23	10.	22	April	2		22
	11	2		24	10.5	21		4	9.5	19
	12	24		25	9.25	21		5	2.25	3
	13	23		26	11.	24		6	11.	18
	14	37		27	11.	23		7	11.	21
	15	32	March	1	9.5	23		8	11.	26
	16	26		2	9.25	21		9	8.5	16
	19	7		3	9.	20		11	10.	20
	20	24		4	10.	24		12	11.25	25
	21	22		5	9.75	19		13	13.	25
	22	23		7	8.5	18		14	12.5	30
	23	22		8	8.25	20		15		26
	26	22		9	7.5	15		17	11.25	21
	27	26		10	9.5	18		18	10.25	24
	28	23		11	12.	24		19	10.75	26
	29	25		12	8.75	20		20	6.5	15
Feb.	1	20		14	12.75	22		21	11.	28
	3	26		15	9.5	18		22	7.25	20
	4	24		16	7.5	17		25	12.	27
	5	26		17	7.5	14		26	12.5	28
	6	26		18	8.	15		27	11.25	25
	8	27		19	8.	13		28	11.5	29
	10	25		21	1.	3		29	12.	29
	11	23		22	5.	11		30	13.5	32
	12	22		23	0.5	2				
	13	24		24	6.5	12				
	15	24		25	0.75	1				
	16	24		26	7.5	15				
	17	21		28	9.5	24				
	18	22		29	3.5	7				

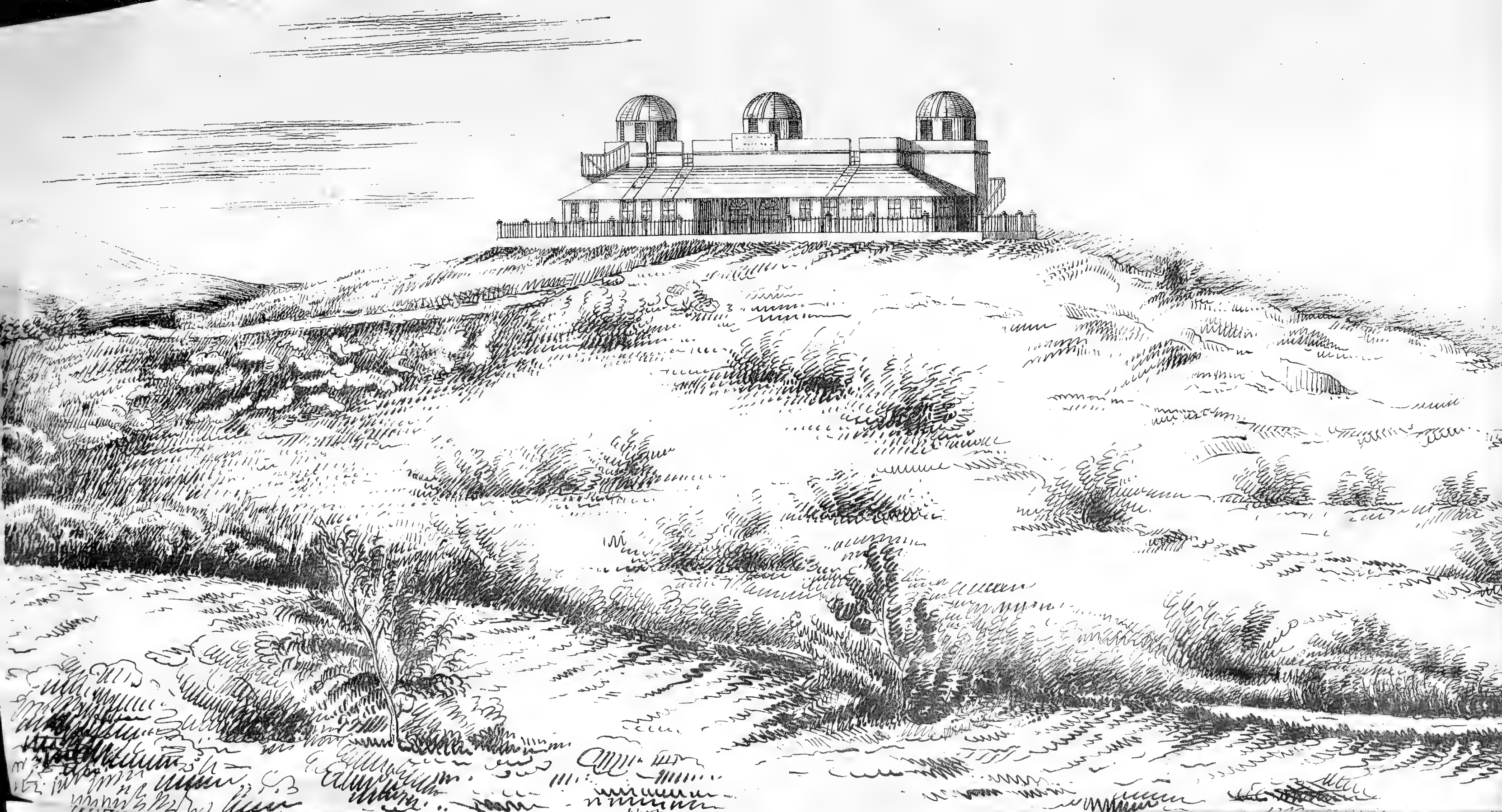
Note.—For an explanation of this table see the accompanying remarks. It may be remarked that the observation of the photometer was not strictly simultaneous with that of the actinometer, but immediately after it.

IV.—*Description of an Observatory lately established at Trevandrum, by* His Highness *the Rajah of Travancore.*—By John Caldecott, Esq. *Astronomer to His Highness.*

His Highness the Rajah of Travancore, already celebrated for the munificence with which he promotes the education and mental improvement of his subjects, resolved in the latter part of last year on the establishment, at his capital, Trevandrum, of an Observatory of a superior kind; with the double view of affording his aid to the advancement of astronomical science, and of introducing by its means correct ideas of the principles of this science among the rising generation under his government; and having confided to me the superintendence of the institution as Astronomer, I take this early opportunity of introducing it to the notice of the public, by a short description (which may be enlarged hereafter) of the three great features of its future usefulness, viz. the building—the instruments—the locality—convinced that the description of a new Observatory so situated, and established with such objects, succinct and somewhat imperfect as at this early stage it must necessarily be, will still be received with lively interest, not only by astronomers in particular, but generally by the many who are now contemplating, with sympathy and admiration, the rapid strides with which intellectual culture is advancing among our native brethren of India.

1.—The Building.

When it devolved on me to design a plan by which the liberal intentions of His Highness might be carried into the most complete effect, it became with me a matter of serious consideration, how the utmost benefit to science might be derived from the opportunity afforded by the proposed institution, without making any very great demand on the funds of the state; and I very soon came to the conclusion that no outlay, beyond what was absolutely necessary to effectiveness, should be made on the building, but that no expense should be spared in procuring instruments of such a size and quality as would ensure to an Observatory, where they were judiciously and actively made use of, a rank second to none in the world. Being supported in this view of the case by Colonel Fraser, the British Resident at Travancore (a gentleman most pre-eminently qualified to judge on such a matter), the plan now to be explained was sanctioned by His Highness, and the building has since been completely and most satisfactorily erected, by Lieut. Horsley, of the Madras Engineers, through whose kindness I am enabled to accompany this, with two perspective views, a plan, section, and elevation, which will render but a short verbal explanation necessary.



TREVANDRUM OBSERVATORY.

View taken from the North West.

Printed Govt. Lith. Press, Fort St. George.

The extreme dimensions (i. e. including the verandahs) are seventy-eight feet in length, east and west, and thirty-eight feet in breadth, north and south; these, although small compared with most other public Observatories, will, it is hoped, prove amply sufficient for all useful purposes.

The hill on which the observatory is erected is a solid mass of laterite, in which granite is largely disseminated, and is so hard as to be penetrated with great difficulty; but little depth was therefore required for the foundations, which are accordingly only sunk one foot below the surface, on which the granite bases for the instruments are erected—this surface is by excavation three feet below the general level of the soil outside, and three and a half feet below the floor of the observing rooms. On it is erected, nearly to the height of the floor, but without contact with it, or with the surrounding walls, a solid mass of granite masonry for each instrument, consisting of large pieces of stone clamped together; that in the transit room (*a*) is ten feet long, by four feet broad; that in the circle room (*c*) ten feet square, and that in the centre room (*b*) six feet square. The walls are two feet in thickness, built of squared stones of laterite, and afford a clear height in the observing rooms of seventeen feet. The meridional openings are three in number, each two feet wide, and extend across the building to within three feet of the ground on each side—they are well secured and conveniently laid open by shutters covered with canvas, and painted, and having slips of copper over the abutments. The roof is flat, and on the centre of it is erected a wooden circular building, of nine feet diameter, with a revolving dome which covers a solid pillar of granite, coming up through the centre room without contact with floor, roof, or any part of the building, and terminating about three feet above the flat roof. This pillar is two feet in diameter at the top, and four feet at bottom, and is erected on the granite base of six feet square—the pillar consists of five pieces in the form of a frustrum of a cone. Two other revolving domes of the same size are placed over the circular rooms at the southern corners of the Observatory, which are square turrets of solid masonry. The roof or terrace is conveniently approached by two stair-cases outside the building, and winding round the turrets. The verandahs are divided into small rooms as sleeping apartments, computing offices, library, &c.

The clear dimensions (inside) of the transit room (*a*) are 14 ft. by 12.
Do. of the circle room (*c*) .... 14 ft. by 12.
Do. of the centre room (*b*) .... 20 ft. by 12.

The breadth of the verandah is eleven feet.

On the north and south faces, and let into a panel, formed in the parapet wall, are to be placed marble tablets, bearing an inscription, as follows :—

THE TREVANDRUM OBSERVATORY,
FOUNDED BY
HIS HIGHNESS
Sree Padmanabha Dassa Vunchee
Baula Rama Vurma Koola Shakhur
Kireeta Pukee Swatee Rama Rajah Bahadoor
Munnei Sooltan Shemshair Jung.

A. D. 1837.

SOOBROW DEWAN.

Colonel JAMES STUART FRASER—*Resident.*

John Caldecott, Esq.—*Astronomer.*

W. H. Horsley, Esq. Madras Eng.—*Architect.*

The inscription on the north face being in English, and that on the south a translation of the same in Malayalim.

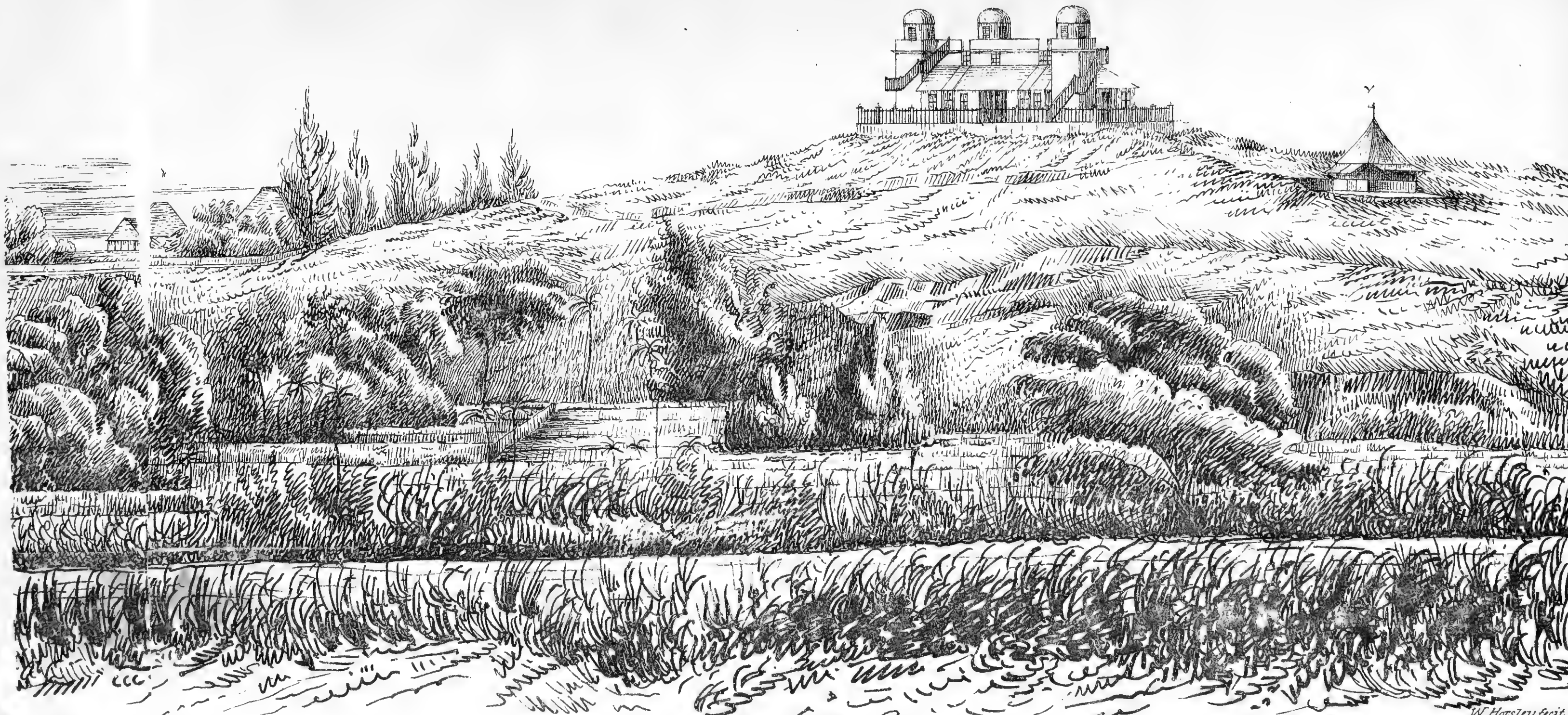
This building was commenced last October, and is now finished, with exception of a little work connected with the granite pillar in the centre room.

2.—THE INSTRUMENTS.

Will comprise—1st. A transit of five feet focal length, and of four inches aperture—ordered from Mr. Dollond, with very particular instructions, that it shall be the most perfect in his power to make. This will be placed in the western meridian room.

2d. A transit clock to be so placed, in a recess cut into the granite pillar in the centre room, as to be easily seen and heard by the observer at the transit instrument, when the door between the rooms is open. This is intended to be as perfect a piece of workmanship as London can furnish.

3d and 4th. Two mural circles of five feet diameter, to be both placed in the eastern meridian room, on the opposite faces of a solid granite wall—one instrument being intended for direct observations of polar or zenith distances, while the other makes simultaneous observa-



Astronom House.
Meteorological Bungalow.

W. Horsley fecit

Drawn on Transfer Paper by Dumphy
Printed by Winchester.

TREVANDRUM OBSERVATORY

View taken from the South West.

tions by reflection from quicksilver in the manner now practised at Greenwich. These two instruments are ordered respectively from Mr. William Simms, and Mr. Thomas Jones, with the same instructions as to perfection as those given to Mr. Dollond for the transit instrument.

5th. A clock, exactly similar to the transit clock, to be placed in a corresponding recess on the opposite side of the same pillar.

6th. An altitude and azimuth instrument, having 18 inch, and 15 inch circles, with three micrometrical microscopes to each, made by Mr. Simms, to be placed on the top of the granite pillar above the middle room, and under the revolving dome No. 1. This instrument having been ordered by me, for my own use, about two years ago, has just arrived at Madras, and is now on its way to me by land.

7th and 8th. Two powerful telescopes, one of the refracting and the other of the reflecting kind, with micrometers and all appurtenances for observations on the double stars, &c. to be placed under the revolving domes Nos. 2 and 3.

Besides these principal instruments, the Observatory will be completely furnished with meteorological, magnetic, and pendulum, instruments and apparatus; and the assistance afforded by His Highness in the observing and computing departments, is as complete and liberal as every other part of the establishment.

I may here mention that until these instruments are received from England, observations will be carried on with small but very excellent ones of my own—consisting of the altitude and azimuth circle above mentioned—a thirty inches transit instrument—an equatorial, by Troughton and Simms—a forty-six inches refracting telescope—chronometers—reflecting circle, &c. &c.

I also take this opportunity of announcing that a system of hourly observations throughout the day and night, of the thermometer, barometer, and hygrometer, has already been commenced at this observatory, the result of which will be duly made public : and this, as supplying an important desideratum in the science of meteorology, will doubtless be received by all cultivators of that branch of physics, with the consideration and gratitude which the present Rajah of Travancore will by it eminently entitle himself to.

3.—The Locality.

The Trevandrum Observatory stands on an insulated hill, about sixty feet high, and 195¾ feet above the level of the sea (as ascertained by levelling), from which it is distant, in a straight line, about two miles. It commands an extensive and beautiful view of an undulating and finely variegated country towards the north, the east, and the south—and (overlooking the declivity towards the sea and its fringe of cocoa-

nut trees) of the sea horizon to the west. The eastern view is terminated by the Ghat mountains, the highest of which subtend an angle of about 2° 15′, the low hills to the north intercept only 45′ : and from N. N. W. to S. E. the view extends to the sensible horizon itself. The country intervening between the Observatory and these boundaries, on the land sides, consists of hills covered with low jungle, having strips of rice-ground meandering between them, and topes of trees interspersed. On a cliff, between three and four miles distant to the south, and of the same elevation above the sea as the Observatory hill, are built walls of masonry, intended to receive three meridian marks; and to the north an equally eligible situation may be selected for those in that direction.

The geographical situation of the Observatory, as nearly as I have yet been able to ascertain it, is as follows :—

Latitude 8° 30′ 35″ north.

Long. 76° 59′ 45″ or 5*h.* 7*s.* 59*m.* east.

These positions cannot, I think, be in error to the amount of 5″ in latitude, or of 2′ (in time) in longitude—they will, however, be settled with more precision shortly.

With the expression of my earnest hope, that the Trevandrum Observatory may, hereafter take an important part in celestial research, and prove useful to science, I shall conclude this brief account.

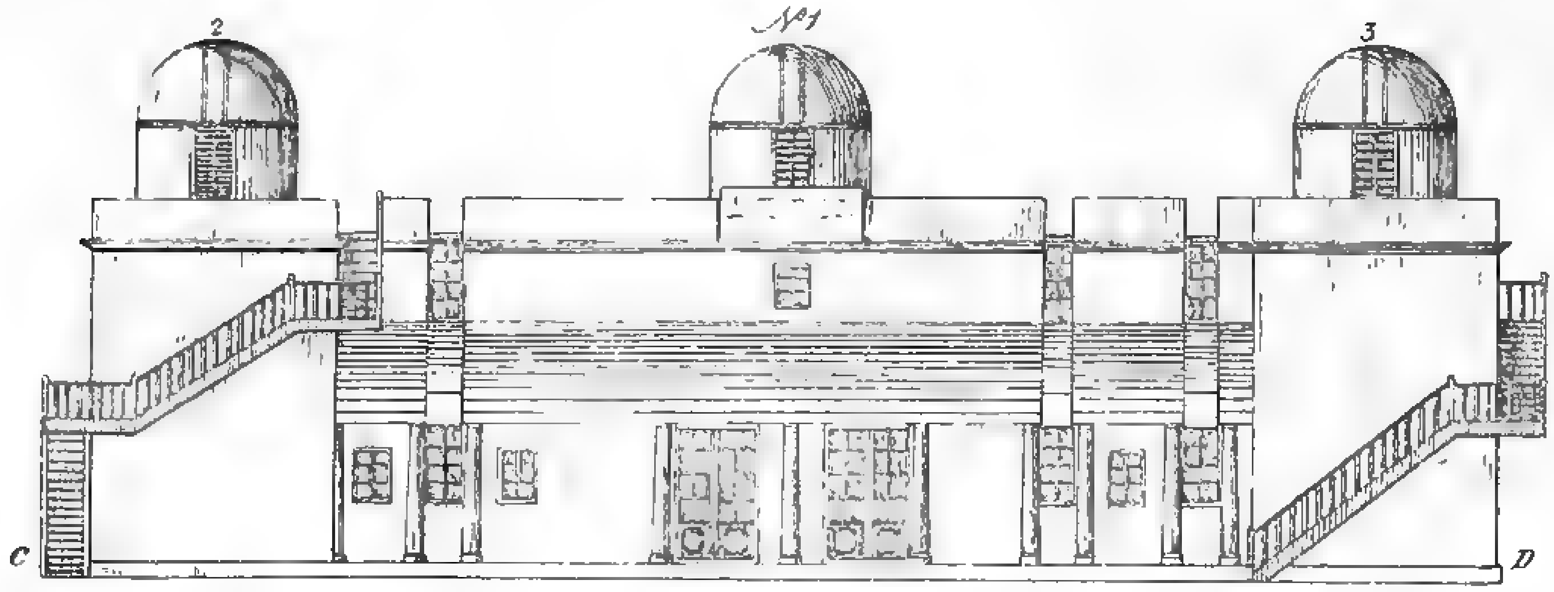
V.—*The Objections made by* T. G. TAYLOR, Esq., *H. E. I. C.'s Astronomer to the Balance Self-Registering Barometer considered ; and further Remarks respecting that Instrument.*—By WILLIAM GILCHRIST, Esq. *of the Madras Medical Establishment.*

In the 15th No. of this Journal Mr. Taylor has advanced several objections to the principle and details of the plan for a self-registering barometer, proposed by me, in the 14th No. These objections I have considered with the attention due to the source whence they emanated, and being humbly of opinion, that those which refer to the principle of the plan do not hold good, I purpose, in the present communication, to state my reasons for thus considering them. With respect to those that refer to the details, it will afterwards be seen that they are easily got over.

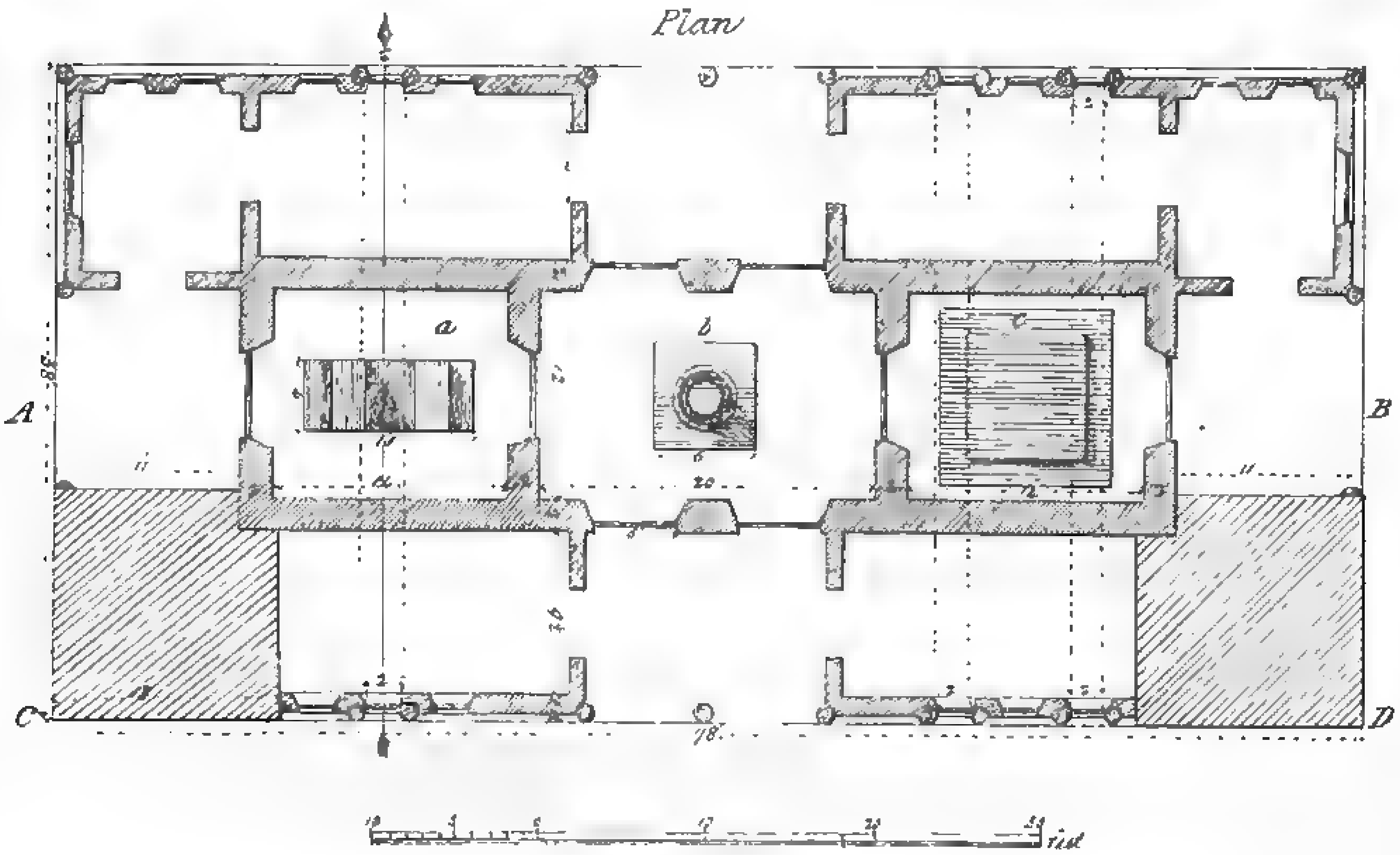
I shall (although in Mr. Taylor's paper it be last stated) first consider the objections referring to the principle of the plan, because, if they hold good, they undoubtedly would be what he considers them "fatal to the balance barometer." In page 308, No 15, of the Madras Journal, the case is supposed of an increase of atmospheric pressure equivalent to half an

South Front Elevation of the

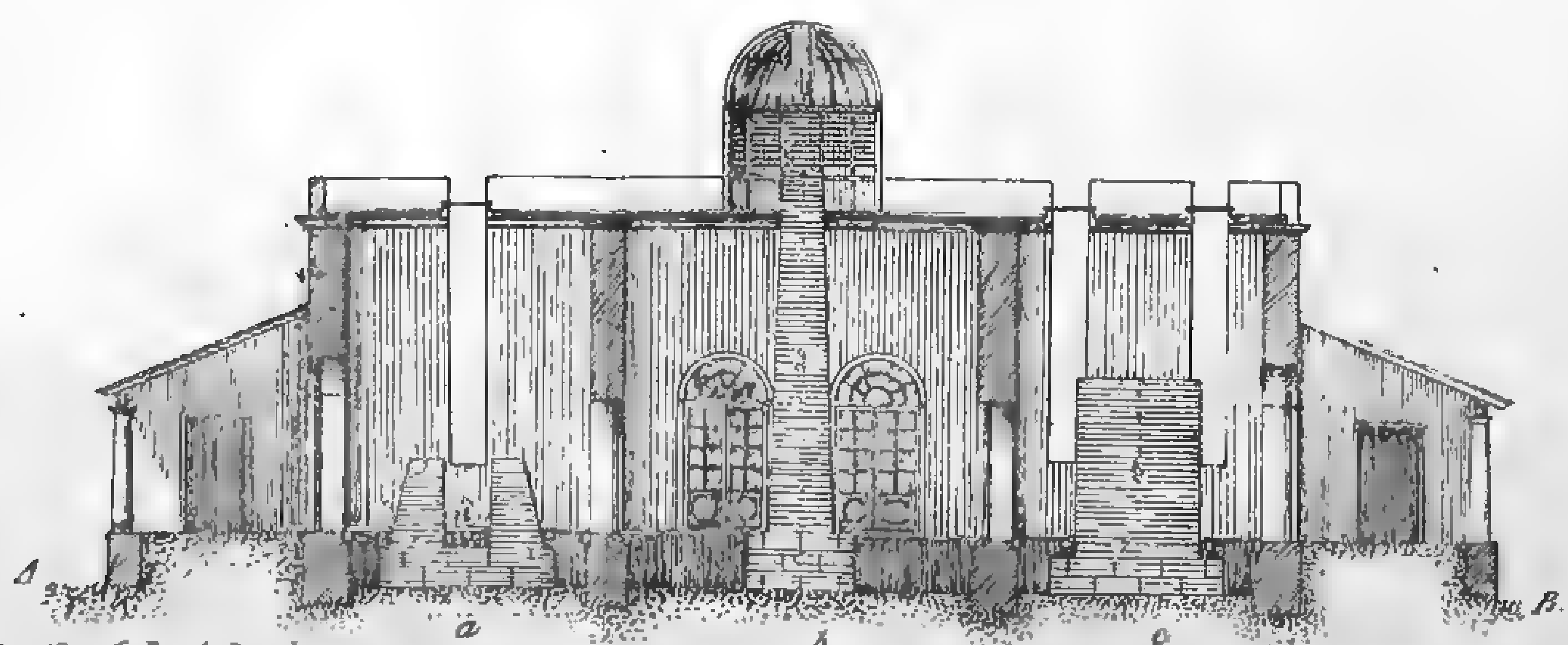
TREVANDRUM OBSERVATORY.



Plan



Longitudinal Section.



Drawn on Transfer Paper by Dunphy.

Printed by Winchester.

inch of the mercurial column, then follow these words "the surface "*cc* rises to *ee* and consequently an additional weight (proportion-"al to *ec*) is imposed upon the barometer end of the balance; now "the effect of this weight being to lower the whole tube bodily, it fol-"lows that a further rise of the surface *ee* will take place, and that, "successively, cause and effect will ensue until the entire tube is fill-"ed, or the end of the tube 'brought up' by the bottom of the cis-"tern." In this sentence I understand by the phrase "the whole tube bodily" the tube and its contained mercury; and by the phrase "further rise" not a rise above 29.5 (the height to which by supposition the mercury has by increased atmospheric pressure risen) but *a second rise,* to that height, the mercury being considered to have fallen with its containing tube, its top surface goes below 29.5, but remains below it only temporarily, as the atmospheric pressure a second time forces it up to that height.

Presuming this to be Mr. Taylor's meaning, I am humbly of opinion that this alternate rise and fall of the mercurial column, does not obtain;—granting for a moment it does, I would arrive at a conclusion as to its effects, different from the one mentioned in the sentence quoted. What causes the tube in the first instance to commence descending? We both answer, the additional weight of half an inch added to the mercurial column. If then the mercury with the tube descends half an inch, it is evident that the mercurial column is shortened to its original length, and consequently the additional half inch weight of mercury is removed; so that the tube, being thus freed of the weight which caused it to descend, ought, I should think, instantly to rise, and remain up until reloaded by a second rise of mercury. By this alternate loading and unloading a perpetual alternate rise and fall of the tube would occur, and of course a perpetual oscillation of the balance: it would appear, however, Mr. Taylor considers that the tube thus lightened will not re-ascend, but, by some means, not mentioned, it will *remain down,* while the mercury makes a *second* rise. But that this alternate rise and fall of the mercury does not occur, will, I think, appear evident when we reflect that the mercurial column is supported by the atmosphere and by that only—the tube merely prevents air reaching the top surface of the mercury, and confines it to columnar limits—when the tube is moved up and down it glides as it were over the mercury, exactly as it would do over a rod of any solid substance, were this substituted for the liquid metal. It is almost superfluous to add this has been proved by experiment.

It does at first sight appear somewhat incredible that the mercurial column, in the case of increase of atmospheric pressure, should continue rising; while the tube containing it, when suspended from a balance, is descending—for the ascent of the former and the descent of the latter

are simultaneous movements. But the enigma is solved the moment we comprehend that there are really two balances concerned, which have a common counterpoise—namely, the mercury. The one balance is composed of this and the atmosphere,—two fluids, the easy mobility of the particles of which allows a ready mutual counterpoise; the other balance is the visible one, of which the mercury and its containing tube at one end, and weight at the other, are counterpoises. Comprehending this, it is easy to trace what obtains, when an increase of atmospheric pressure occurs; the air forces into the tube mercury equal in quantity to its increased weight, and thus effects a counterpoise. But this increase of mercury destroys the equilibrium previously existing between it and the weight; the former preponderating, its end of the balance necessarily descends, but while the tube is descending, the mercury and air preserve their equilibrium, so that the former remains, in the case supposed, at 29.5 inches above the surface of that in the cistern, while the tube slides over it in the manner already described. It may be said that this explanation offers an objection to the balance barometer *more serious* than the one advanced by Mr. Taylor; inasmuch as his shows only an intermitting pull, while this shows a constant one. If no check to the unlimited descent of the tube existed, this would hold good; but let us now attend to what occurs to the lower portion of the tube. Here, as Mr. Taylor remarks, "it must be "recollected that the part of the tube immersed in the quicksilver, les- "sens the weight imposed upon this end of the balance, to the amount "of the weight of an equal volume of quicksilver." When, therefore, atmospherical pressure causes a given volume of mercury to enter the tube, this descends from increased weight, and necessarily dips into the mercury in the cistern: but this dipping causes the tube to lose so much of its weight as is equal to the volume of mercury it displaces;—so when the volume of mercury thus displaced equals that which entered the tube, an equilibrium is effected; the tube has lost the weight it gained; a further dipping would make it lighter than the counterweights, because, the mercury remaining at 29.5, no additional weight is added by the column; while the further descent of the tube into the mercury makes it as much lighter as the volume of quicksilver it displaces; a further descent of the tube is thus prevented, and if it forced down further than the point at which this equilibrium occurs, it WOULD RISE to that point when the foreign force thus depressing it is removed. Here, then, in this principle of specific gravity, we observe a *third* balance concerned in the balance self-registering barometer; which, like the one consisting of the atmosphere and the mercury, is of the nicest sensibility; and the third balance discharges the important function of preventing the unlimited descent of the tube. The above are the reasons that induce me to think that the *principle* of my plan is correct.

Although this principle of specific gravity is necessarily concerned in the balance barometer, it will not prevent the tube descending further than a given distance, unless a certain relation exists amongst the portion of the apparatus concerned in that principle. Thus, if the tube be of a wide bore and very thin, so great a length of it would dip into the cistern, to displace a volume of mercury equal to what entered the tube by atmospheric pressure, that it might touch the bottom before the equilibrium were effected. Moreover, in the case of tube with expanded top, such as recommended in the original description, the tube increases in weight merely from descending, as this descent (as will afterwards be particularly shown) magnifies a portion of the narrow column of mercury, to the area of the large bore at top. It is not therefore to be inferred from the mere inspection of the plan, that this principle is the intended check to the unlimited descent of the tube. These remarks I consider it only justice to Mr. Taylor to make, because I have no doubt that, owing to my omitting to mention in the description of the plan that this is the check to the unlimited descent of the tube I had in view, he was induced to object to the balance portion of the apparatus. In the description of the plan (Madras Journal No. 14, page 27) I mentioned, that a balance, on the usual principles, will suit the purpose of the barometer ; and the details of its construction there given, are, as there acknowledged, those recommended for delicate balances by Mr. Braddock, a gentleman to whose mechanical ingenuity and scientific attainments the pages of this Journal bear ample testimony. In such a balance, the centre of gravity is but a small remove below the fulcrum, so that with reference to Mr. Taylor's *first* diagram, the product of a very small additional weight (although much less would do, say 7 grains equal to $\frac{1}{1000}$ of an inch of the mercurial column in the upper part of the barometer) into *a e* would exceed the product of the weight on the end *b* into *b f*, how low soever *a* descends ; consequently, did no check to unlimited descent exist, the barometer end of the balance, always preponderating, would descend, and allow the tube to go down until it would reach the bottom of the cistern. In the absence of any mention of the required check it occurred to Mr. T. to place it in the balance ; and, as the delicate one proposed, did not suit his views, he proposes to modify the balance in question, by placing the centre of gravity considerably below the fulcrum ; in the particular case stated " about two inches." This ingenious idea of Mr. Taylor's would of course effect the object in view. The two objections which he mentions may be urged against it, do not appear of much importance, for with respect to the *first*, simply by moving a weight up and down a screw, may be effected the adjusting of " the axis of suspension to the height above the centre of gravity as shall render the scale we have adopted correct :" and with respect to

the *second*, which virtually is the necessity of having "recourse to computation," if this is to be considered an objection, what would become of Science—more especially of the department of which Mr. T. is the industrious cultivator? A more serious objection to it is, that it blunts the sensibility of the instrument, for, *ceteris paribus*, the lower the centre of gravity is placed below the fulcrum, the less delicate is the balance, and as this objection does not hold good with respect to the specific gravity check, it appears to me the more eligible one. In the weighing balance, the centre of gravity is placed below the fulcrum, to produce oscillation; also horizontality of beam, when equal weights are in the scale pans, but as oscillation is not required in the balance barometer the first variety of beam, named by Mr. Taylor, may be used, since the least additional weight moves it, while it is prevented upsetting by the dip or the immersion of the tube into or out of the mercury. In this variety of balance, having also the points of suspension in the same plane with the fulcrum, there is no tendency to move in any direction when equality of weight exists, but remains equally at an angle with the horizon as parallel to it; this therefore is exactly the balance wanted. If I understand Mr. Taylor aright, he considers objectionable the quantum of weight that will necessarily be on the balance, namely "tube of iron," column of "mercury," &c. It is no doubt true that the more a balance is loaded, it is the less delicate, but in the present case this appears more a theoretical than a practical objection, inasmuch as "in Europe, where every obstacle in the shape of workmanship vanishes," balances are made, which, when loaded much heavier than what the balance of the barometer requires to be, turn with much less than 7 grains. A balance has been made of such nice sensibility, that, when loaded at each end with 250 pounds, it turned with one grain.*

As to the substance of which the tube consists, this necessarily requires two qualities amongst others: 1st, impermeability to air; 2d, the power of resisting the chemical action of mercury. Glass combines both of these qualities, and the only objection to it is, its liability to fracture when boiling the mercury—of the metals, only two, so far as I am aware, are not acted on chemically by mercury—namely, iron and platinum. The former Mr. T. has shown to be objectionable, not being air tight. How is the latter circumstanced in this respect? If some of the other metals are impermeable to air, would it not suit to plate with the most eligible one so much of the tube as will not dip into the cistern?

I proceed to mention what appear improvements on the plan as originally proposed—1st. *With respect to the register apparatus.*—It is advisable to remove the counterpoise weights UUU (Madras Journal

* This balance was constructed on the plan and under the direction of the late Captain Kater, V.P.R.S. for verifying the national standard bushel—vide Phil. Trans. 1826.

No. 14, plate 15), from the pencil rod, because as the beam in rising above the horizontal or going below it, describes an arc, this rod with its weights, is moved more or less from the perpendicular, when both will have a tendency to bear on one of the guide rods YY. Supposing therefore the rod *f s* to terminate at the scale pan T, the register apparatus below may be moved further to the right. From this the pencil rod may rise to the beam, which of course must be prolonged, in order that the points on which the rod bears may be perpendicular above the register roller. The disadvantage of the pencil rod deviating from the perpendicular still remains in this arrangement:—but the end of a beam two feet in length, moving two inches upwards or downwards, deviates from the perpendicular only about quarter of an inch. Further, in the tropics the ordinary range of the barometer rarely exceeds a quarter of an inch (Daniell on Meteorological Essays), and during the storm that occurred at Madras 30th October 1836, which must be considered as an extreme case, the range of the barometer (as observed at the Madras Observatory, and recorded Madras Journal No. 14, p. 211) was only 1.135 inch; now, as the pencil rod will be very light, it is possible that the deviation under consideration, may occasion so very little difference between its absolute weight and its weight as bearing on the beam, that the objection thence arising may be more a theoretical than a practical one. It may, however, should the latter obtain, be completely avoided by placing an arc at the elongated end of the beam, the radius of which is the distance between it and the edge on which the balance turns. The pencil rod may be attached to this arc by means of a piece of platinum wire fixed to the top of the latter, which is of such fineness, that, while sufficiently strong to support the pencil rod, it is so flexible as accurately to adapt itself to the arc. It is evident that by this means the pencil rod will be moved up and down perpendicularly, as it will always be a tangent to the arc when this moves. If the arc be a perfect segment of a circle, the weight of the pencil rod will act with a uniform power on the balance, which of course it will not do if the arc be not such a perfect segment—and as there may be some difficulty in making this, it becomes a question, which of these two modes of attaching the pencil rod to the beam is the less objectionable. Should both be found practically defective, the pencil rod may be laid aside altogether, and the Mordan pencil furnished with its delicate spring, as mentioned in the original plan, be attached direct to the end of the beam at right angles to this. Thus situated, however, the pencil will require a plane surface on which to make the register, for in the case of the cylinder the pencil is a tangent to it only in a straight line, while the pencil, in the position stated, will describe an arc, as the beam moves up and down—consequently the hour lines instead of being straight as in the cylinder, must on this plane surface be seg-

ments of a circle, of which the radius is the length between the pencil and fulcrum of the beam. Further, while retained perpendicularly it will require to be moved horizontally, either towards the balance or from it, according as the hour lines are numbered from the right or left side of the plane. The clock-work that (as in the cylinder) gives motion to the plane, must be moved up towards the pencil end of the balance. The plane surface will best consist of glass, which when slightly ground (or frosted) with fine emery, will easily receive the pencil trace. It has the very great advantage of being little affected by heat or moisture, while the hour and horizontal lines may be drawn on the side opposite the one on which the pencil plays, so that this has a smooth surface on which to traverse, whereby the obstruction that might arise from those lines is avoided. From these planes it will be easy to read off to any degree of minuteness the pencil trace by means of a T ruler, the perpendicular limb of which will require to be graduated and furnished with a moveable vernier.

2d. *With respect to the lower portion of the tube.*—It was originally intended to make this sufficiently thick to displace the quantity of mercury necessary to balance that added to the length of the mercurial column by atmospheric pressure—instead of retaining so much solid iron, it is preferable to have a hollow cup of uniform area, and as the bulk of this that will enter the cistern will very nearly equal the bulk of mercury removed, very little alteration in the height of the latter in the cistern will occur. The cistern therefore need be no larger than will admit of the tube to move clear of it, and would best be of an oblong form as the horizontal motion of the tube, that, namely, occasioned by the beam describing an arc, is only in one direction. In the balance barometer the expanded bore at top is only of such length as to meet variations of atmospherical pressure accruing at any place, where the instrument is put in operation, and not for difference of *relative height of situation*—thus if the enlarged bore at top be only four inches long, it is evident that, at an elevation of about 4,000 feet, the mercury will have descended out of it—either the tube must be lowered or the cistern raised. This adjustment can easily be made by means of a screw—however, as a great portion of a tube that would suit at the level of the sea, must for an elevation of 6,000 or more feet be immersed in the cistern, this latter would require to be proportionally deep: by having tubes of different lengths, this increased depth might be avoided.

3d. *With respect to the magnifying the indications*—In addition to the mode mentioned in the description of the plan for this purpose, another suggests itself from what has been mentioned above respecting

the principle of specific gravity. This latter mode, which has the very great advantage of not losing power, consists in so proportioning the thickness of tube or size of cup in the cistern to the quantity of mercury added to the column by atmospheric pressure, that the tube can be moved by a small increase of column to any length required. In the case of a tube of uniform bore throughout (where no additional weight of mercury is added by moving the tube downwards), it is obvious that the thinner the lower end of the tube is, a proportionally greater length of it must dip into the mercury in the cistern, before a volume of mercury is displaced equal to what has entered the tube. But, in the case of the tube with expanded bore at top, it is evident that after atmospheric pressure has produced its full effect in increasing the weight of the mercurial column, further weight is added *merely by the continued depression of the tube*—because this depression magnifies, according to the length of it, an equal extent of the *small area* of narrow portion of the mercurial column to the large area of expanded top. This will appear evident on referring to Mr. Taylor's second diagram, in which if *c c* represented the bottom of the expanded portion before the tube be moved down, the upper portion of the narrow column *d* will after the tube descends be magnified to *c c*.

With respect to the expanded tube, therefore, when it is wished to magnify the indications, the increased weight of mercury occasioned by a given atmospherical pressure, must be added to the weight occasioned by the descent of the tube to the extent of the enlarged indication wanted, and the area of the float made of such size as the product of it into the length of the enlarged indication will equal the sum of the bulks of the two weights of mercury just named. Suppose it is desired to magnify the indications five times—expanded upper portion of tube being two inches square, small bore of tube one-tenth of an inch square. Here, for $\frac{1}{10}$ of an inch of rise of mercurial column, the tube must descend $\frac{1}{2}$ inch; taking the cubic inch of mercury to weigh 3434,

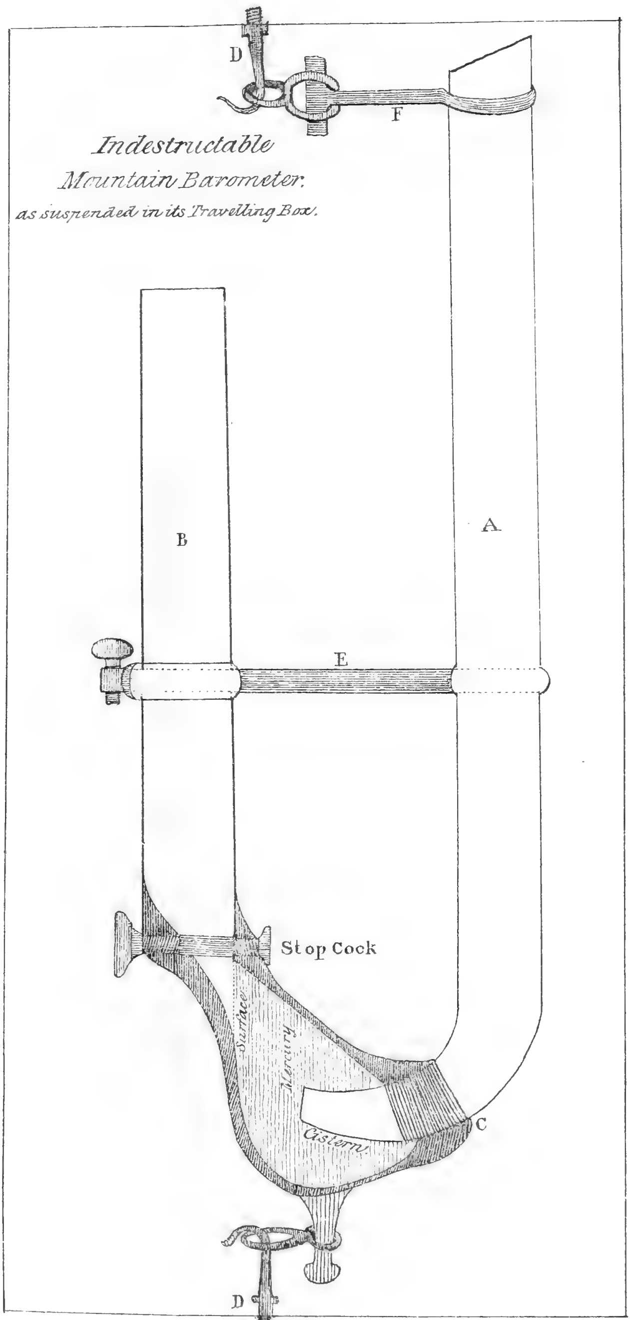
Then one cubic inch ($= \frac{1}{2}$ of 2 cubic inches)	=	3434
From which deduct weight of mercury already in bore $= \frac{1}{10}$ inch area $\frac{1}{2}$ inch long.		17.17
Weight of mercury added by $\frac{1}{2}$ inch depression of tube.	=	3416.83
$\frac{2}{10}$ of one cubic inch ($= \frac{1}{10}$ of two cubic inches) added by atmospheric pressure.		686.8
Sum of weight of mercury added by pressure and depression	=	4103.63 grains.

Then $\frac{\frac{1}{2}\text{ cub. inch mer.}}{1717} : 4103.63 :: \frac{\text{area sq. inch}}{1} : \frac{4103.63}{1717} =$ 2.39 square inches the area of the float, A correction is of course required for the thickness and specific gravity of the substance of the cup float. In an

instrument such as the present, where practical construction may not have the correctness of its theoretical one, it would appear that the more accurate way of dividing the scale will be to do so from the indications of a standard barometer of common construction.

In the case of the cup float there will be a tendency to move the tube from the perpendicular, in consequence of the lower portion of the tube being so much lighter than the upper. This tendency, however, is easily prevented by lowering the centre of gravity of the tube, for which purpose two rods attached to the tube may descend outside the cistern to a convenient distance below it, to support a disc on which a weight may be placed. This weight will if sufficiently heavy bring the centre of gravity of the tube completely below the cup float. Indeed, if this float be sufficiently large to buoy up the tube, the balance part of the apparatus may be laid aside altogether, and the weight below the cistern, acting on the principle of ballast, will preserve the tube in the perpendicular. In order to keep the tube steady it would be necessary to have guides on either side of the tube—the pencil can be attached to any part of it, and made to bear directly on the register roller, which, as the tube moves perpendicularly, may be made in the manner described in the original plan, and in order to admit of the indications being magnified, the upper part of the float can be contracted.

Respecting form No. 2, (Fig. 1st, plate 15, Journal No. 14) the imperfection Mr. Taylor has pointed out as to the impossibility of knowing whether "air does not exist in the quicksilver between *e* and *c*," is certainly a very serious one and indeed applies not only to the part E C but to the entire tube, since the possessor of such an instrument would not, as in the glass tube, have the advantage of ocular demonstration as to the presence of air; but would be left in doubt on this essential point. Presuming that the objection to iron will be got over by stating it as above mentioned, the following arrangement appears to remove the imperfection under consideration. Let the end C of the metallic tube *rise* into the middle of a cistern, after the manner that the glass tube of the Englefield barometer *descends* in the iron cistern—so that in what position soever the instrument be held the termination of the tube will always be immersed in mercury. On the top of this cistern let there be a stop-cock from which rises the glass short limb—lastly, let a screw enter one side of the cistern, which, when screwed home, will occupy a considerable portion of its area. Suppose now the entire long limb filled with mercury, the stop-cock K turned to prevent its return, also the cistern (the screw being out as far as possible) filled with mercury. Let now the glass limb be attached, and the cistern screw screwed home. Mercury will now stand in the glass tube at a given height—which ought to be engraved on the instrument.


Indestructable
Mountain Barometer.
as suspended in its Travelling Box.
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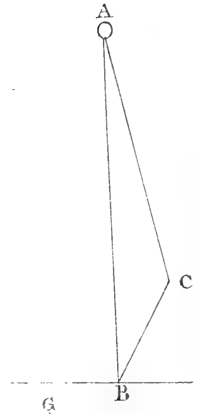
F
B
A
E
Stop Cock
Surface
Mercury
Cistern
C
D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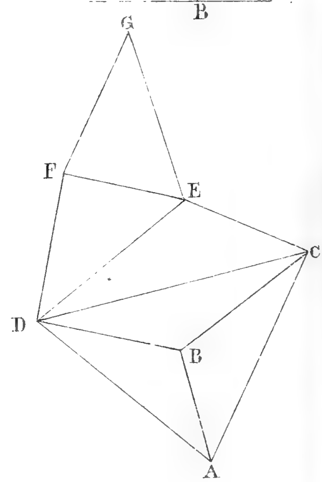
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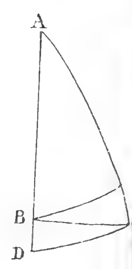

A
B
D

Now, presuming the instrument-maker has thoroughly expelled the air on first filling the instrument, all that the possessor would require to do in order to satisfy himself as to the pressure of air in any portion of the tube, would be to incline it in order to fill the long limb, turn the stop-cock *k* and screw home the cistern screw. If the mercury now stands at the height mentioned on the instrument, it of course must be as perfect as when it left the maker. The long limb ought to be sufficiently capacious to contain all the mercury in the glass limb, and part of that in the cistern, so that when the stop-cock above the latter is closed, there will be as much air in the cistern as will allow space for the expansion of the quicksilver in the whole tube, while this air is prevented entering the long limb, as the end of this will always be immersed in mercury. A simpler form than the above would consist in adopting that of the Englefield barometer, with the addition of a short glass limb rising out of the cistern, the long limb having expanded top, to contain the mercury in the short one, and part of that in the cistern as above mentioned. If this arrangement were applied to M. Gay Lussac's barometer, the possibility of air entering the long limb would be much more likely to be prevented than by the inverted cone, which after all, does not prevent the entrance of air, but merely confines what may have got into the lower part of the mercurial column. The instrument also might be carried in any position, which at present it does not admit of without the danger of air entering.

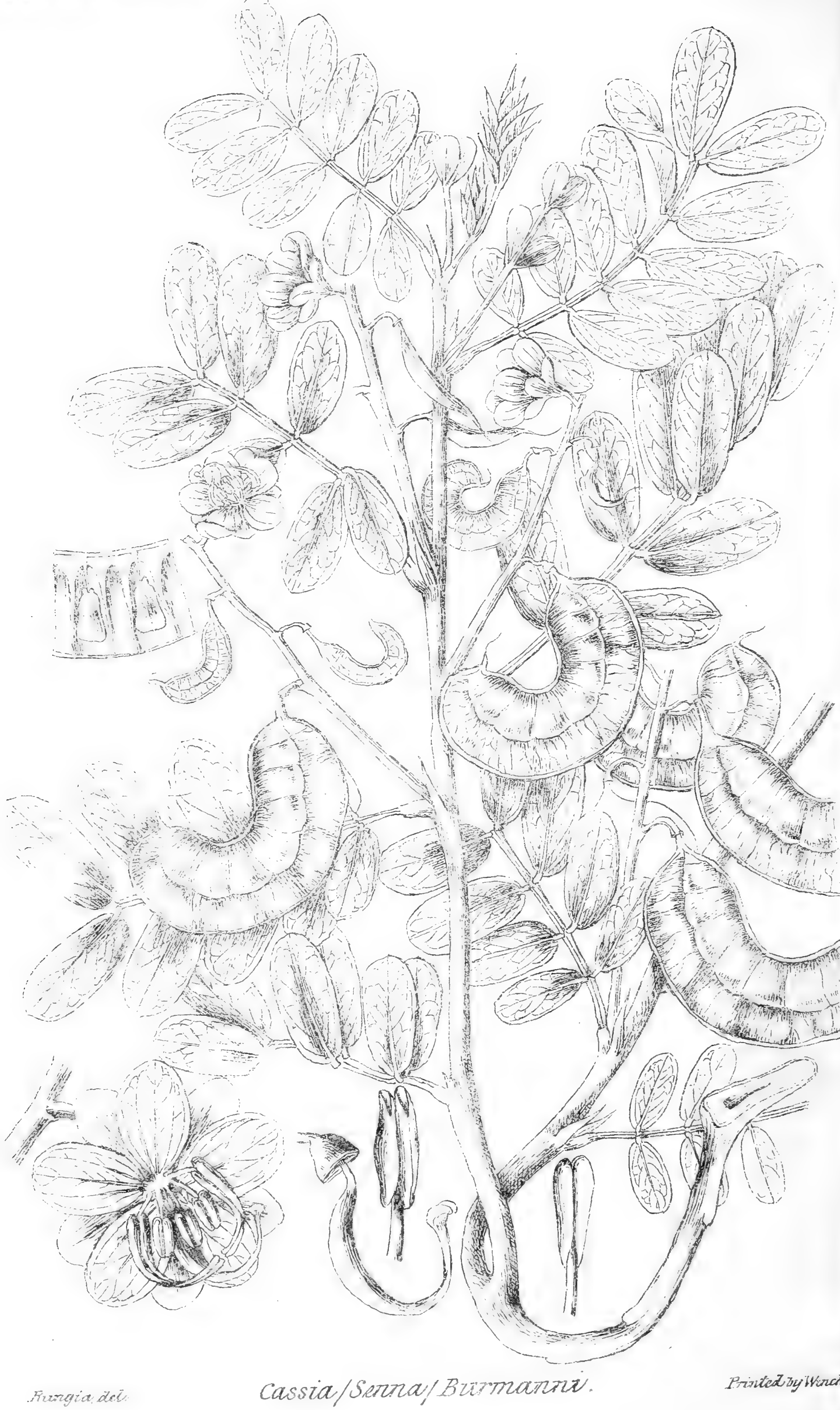
VI.—*Further Remarks regarding a Plan for an Indestructable Barometer.—By Captain* George Underwood, *Madras Engineers.*

In the remarks of the Astronomer of Madras, respecting the Indestructable Barometer and Self-Registering Apparatus, recommended by Dr. Gilchrist, I observe that Mr. Taylor admits that an iron tube can be rendered air-tight by the application of caoutchouc varnish, but adds that this precaution was eventually of no avail on the application of fire, for the purpose of boiling the quicksilver in the tube. Now, since the mercury may be boiled in the tube *before* applying the varnish, I cannot understand why the iron should be condemned for the reason alluded to. True it is, that, with such a material, air bubbles cannot be discerned, and with any opaque substance the liability to error is vastly greater on that account, if some means cannot be adopted for ascertaining the existence of so much air as shall vitiate the observations. However, in furtherance of some hasty and brief recommendations which I ventured to forward to the Journal on the subject

of an indestructable and self-registering barometer, as iron was likewise mentioned by myself, I trust I may be pardoned for throwing out the following suggestions, although I am not certain that Mr. Taylor commented at all on the plan proposed by me, since "No. 2" merely is mentioned, without names being specified. The approval which that scientific gentleman bestows on the self-registering apparatus of No. 2, (deeming it very well worthy of attention and likely to be adopted, if the difficulties before stated in the syphon tube can be obviated), as it works on the same *principle* as that proposed by myself, induces me to hope that something may be yet done to bring the matter to a successful issue. For observatories and fixed stations a syphon tube of glass, or semi-transparent porcelain (as suggested by a friend), will at once remove the objections justly stated by Mr. Taylor, and in my first letter this recommendation was accidentally omitted, for at that time my attention was more particularly turned to the rendering barometers, if possible, *indestructable*, and more useful to travellers. The drawing annexed, (Pl. 4. fig. 1.) will, I really think, serve to show that an iron syphon tube may be so constructed as to be easily filled and carried about without the chance of air getting either into the longer limb, or into any situation from which it will not be immediately expelled, when properly prepared for action—(vide figure and remarks). By tapping the barometer while horizontal before working it, the air bubbles will rise to the surface near the stop cock; for since the cistern was nearly full of mercury originally, no additional quantity of air can ever enter it, since the stop cock will be made mercury tight: the passage of air through it will be advantageous. There is room also for the mercury to expand in high temperatures, and after a journey, when the instrument is laid horizontally, trifling particles of air, which may adhere to the sides of the cistern, can be readily expelled by heating the screw end of the cistern after opening the stopper. It will be manifest, also, on inspection before placing the barometer vertically, whether much air has entered the instrument, for the mercury to allow of such occupation must necessarily have been *forced* through the stop cock or screw; but this seems an impossible case, while the air itself can be so much more easily pressed through those places.

From trials with an iron barometer in my possession, I think the long tube should be of one uniform bore throughout, and not larger at the vacuum end, as before recommended by me, unless made by the most careful and expert workman, since the difficulty of boring the latter, and the trouble of expelling air from it, become very great; while the scale also requires more than ordinary attention.

... profession of a medical plant, permit me to offer a few



Rungia del.

Cassia (Senna) Burmanni.

Printed by Winch[illegible]

Remarks on the Figure.—The long limb A, is independent of the other, and the short tube B, with its cistern, stop cock, &c. screws on it at C. By this arrangement the long limb can be easily filled and the mercury boiled therein. When the short cistern limb is screwed on, while the other lays horizontally, mercury can be poured into the cistern to the level of the dotted line, and, from the peculiar shape thereof, the cistern will be as full as requisite, and very little air can remain in it on closing the stop cock. By inspection it will appear evident, that, turn the instrument as you will, the end of the long limb will be always immersed in mercury, and the contained air forced against the sides of the cistern. To keep the air in the cistern always in one part clear of the long or vacuum tube, if suspended in a box large enough to allow of its swinging freely on the hooks DD, no error will arise. The cistern end should always be carried uppermost in travelling or moving.

E. Iron bracket to support and steady the short limb.

F. A suspending iron and ring at the end of the long limb.

VII.—*Notice (with a plate) of the* Cassia Burmanni, *with Remarks on the Materia Medica of India.*—By Robert Wight, Esq. m. d., f. l. s.. *&c. Member of the Imp. Acad. Naturæ Curiosorum, Surgeon on the Madras Establishment.*

Madras, 20*th June,* 1837.

My dear Sir,—At the close of my remarks on the cultivation of Senna, page 362 of your last Number, I mentioned an indigenous species possessing considerable medicinal properties, and added, that I should endeavour to procure specimens, from which to prepare a figure. I have now the pleasure to send you a drawing, rather too small to do justice to the subject, but so perfectly characteristic, so far as it goes, as to enable any one who may chance to meet with it to identify the plant---which is all that is wanted.

A recent notice in the public prints of a report by the 'Drug Committee' shows that it is the wish of government, to render this country as much as possible independent of foreign aid in the medical store department, by drawing on the resources of the country itself, for the supply of those medicinal agents required in the treatment of its more prevalent and dangerous forms of disease. As I have at different times paid a good deal of attention to medico-botanical subjects, you will, perhaps, under the protection of a medical plant, permit me to offer a few remarks applicable to the occasion of this paper, though less strictly

appertaining to the objects of the Madras Journal, than to one exclusively devoted to medicine.

The report, which appears to have for its object that of showing the course to be pursued in forming an Indian Pharmacopoeia, has not yet, so far as I have learned, reached Madras, and as the notice I have seen does not mention the measures which the Committee propose to pursue for the improvement and extension of our knowledge of that department, my remarks and suggestions will be entirely confined to it.

A cursory retrospect of the history of Materia Medica is sufficient to satisfy any one, however slightly conversant with the subject, that to complete a work of the kind contemplated by the Committee, of even moderate pretensions, is a task of great difficulty, owing to the many sources of error by which it is beset; and such a work can only be raised to the first rank, by the slow accumulation of experience, resulting from repeated experiment and observation, carefully distinguishing, at every step, between the jarring coincidences of *post hoc* and *propter hoc*: the result of which, in many instances, will be, to discard, as inert, medicines which have long enjoyed unmerited reputation, the removal of each of which must be esteemed an advance towards perfection.

The Hindoo Materia Medica, like that of all other nations but little advanced in civilization, is no doubt loaded with many such unworthy articles, but probably not much more so than those of Europe were two centuries ago; of these some may at once be struck out; others, however, can only be removed by the tedious process above specified. On the other hand it embraces many medicines of vast activity, but with whose powers, and the methods of administration best suited to elicit them, we are yet comparatively unacquainted. To detect error in the one case, and to ascertain the existence of valuable properties in the other, the same course must be followed, and not by one man, or in one place, but by many, and in different situations, each, moreover, making sure that he is experimenting on the same plant.

This last precaution is of greater importance than some might suppose. I have repeatedly had wrong plants brought to me, when I had no other means of making known the one wanted, than by reference to the native name assigned in Ainslie's Catalogue, and I have also seen two persons sent in different directions for the same plant, bring different ones, each insisting that his was the true one, and some times both at variance with the systematic name given as the synonym. I know an instance where a gentleman experimented most perseveringly with the common physic-nut (*Jatrophacurcas*) on the supposition that it was the true Croton tiglium, being brought to him by his dresser as the plant so named in Ainslie's Materia Medica. The very same thing happened to myself and on the same authority; I simply put the book into my native dresser's hand, made him read the name, and asked him

if he knew the plant—" yes, plenty grow here," was the reply, and the one brought was, as in the above instance, the *Jatropha*. I fortunately knew the difference, and was saved the trouble and disappointment of prescribing grain doses of a medicine that may be taken in half drachm ones, or many seeds, even, be eaten with impunity, provided the embryo, in which their activity is concentrated, be carefully removed. The fact here stated, will no doubt account for some of the very contradictory statements we occasionally hear from practitioners, who have been separately using, as they supposed, the same medicine, one declaring it of great activity, while the other maintains that it is perfectly inert, or at least that its activity is far below what other accounts gave him reason to expect. Such then is the present state of Indian Medical botany, and so long as this kind of uncertainty attaches to the investigations of those who endeavour to raise it to a higher rank in science, by carefully conducted experiment and observation, it is next to impossible that they can succeed, or that it can ever advance to that degree of perfection which it is now the anxious wish of the supreme government it should attain, and might under proper management be made to attain.

Our present knowledge of Indian medical plants is principally derived from the works of Drs. Fleming and Ainslie. These, for the most part, are little more than mere catalogues of native names of plants, with the botanical ones, so far as the authors had the means of ascertaining them, attached, but generally without descriptions, and in no instance with figures of the plants referred to, by which a person unacquainted with botany could ascertain the identity of specimens supplied by a native druggist, with the plant named in the catalogue; and, for want of plates, these, in all other respects valuable, works, to this day remain almost a dead letter. They, it is true, refer to works where botanical characters, and sometimes plates, are to be found, but the books so quoted are in few hands, some of them of great rarity, or so costly and bulky that few can afford to purchase them, or if they did, could conveniently carry them on a march : while Willdenow's *Species Plantarum*, in nearly all cases the leading authority, requires, on the part of the person consulting it, a proficiency in botany, to make out a plant from his brief characters, not easily acquired, and which few obtain.

When these authors published, such was the backward state of the arts in India, that, had they wished it, they could scarcely at any cost, short of sending their drawing to England to be engraved, have illustrated their works with figures of the plants named. Times are now greatly altered : the discovery of lithography, and its application to the representation of objects of natural history, has effected this

change: now, as the accompanying figure proves, we may even have good coloured representations, and, I believe, at an expense little if at all exceeding what similar ones would cost in England; say, for quarto sized coloured plates, about 30 or 35 Rupees the hundred, and executed in simple outline, in the manner of those I have already published in the Journal, for less than half the sum.* We may now therefore fairly assume, that, under the double advantage of enjoying the fostering aid of the Supreme Government, and profiting by the flood of light which the unceasing labours of vegetable physiologists has of late years cast on the relationship existing between the natural affinities, botanically considered, and the active properties of plants, the time has arrived for making a rapid advance in this important department of medicine. With these collateral aids, little more is required than industry and judgment on the part of the compiler, to lay the foundation of a local medical botany as perfect as any yet extant. That sufficient materials for such a work are already in existence, I think I may with confidence assume, from having myself, with but little care, collected a considerable store, with the intention of undertaking the work on my own responsibility, should circumstances favourable to its prosecution occur. These it has not yet fallen to my lot to enjoy; and, hitherto, the only advantage I have reaped in return for a heavy expenditure, has been some experience of the manner in which, I think, it should be executed.

It only remains for me to add, as the deduction from the preceding observations, that I consider it next to impossible, without the aid of pictorial illustrations, to make any considerable progress in the knowledge of Indian Medical Botany, and that as these could now be supplied at very moderate cost, the subject seems to be one meriting the attention of government. For myself I am so thoroughly satisfied of the utility, or rather the absolute necessity, of plates, towards aiding the investigations of the naturalist, and more especially those of the tyro in natural history, that I consider it almost a duty to publish, so soon as circumstances will permit, a series of figures representing one or more species of each of the natural orders defined in my peninsular flora, with the view of facilitating the researches of those who (perhaps for the first time) have given their attention to that method of arrangement since the publication of that work. The principal obstacle to be sur-

* This is cheaper than the Monthly botanical periodicals. The Botanical Magazine, the cheapest of these, charges at the rate of £4 0 4 per 100 4to. plates with letter press descriptions to each, and has a circulation of about 1400 copies. On so large an impression the cost of copper-plates and printing scarce exceeds a half-penny for each impression the principal outlay therefore is the colouring and paper, which cannot be lessened by repetition.

mounted, in embarking on such publications, is the expense necessarily incurred before any return can be expected; and then the uncertainty of finding a demand for such costly works, sufficient to indemnify the publisher for his risk and first heavy outlay. Whether it will be possible to overcome these impediments in Madras I have yet to learn, but enquiry is now on foot, and if I find that it can be 'got up' at so cheap a rate as to secure for itself, such a sale as will nearly cover the cost, I shall be happy to avail myself of the issue of your next number to make known the plan, and exhibit a specimen of the work, by the publication of a prospectus, and in the mean time, if any among your readers are desirous of encouraging the undertaking, they, by making their wishes known, may greatly contribute towards having them gratified, as the names of even a few unexpected subscribers may go far in determining the course I shall pursue. Apologising for the unexpected length to which this letter has extended,

I remain, dear sir,

Yours ever faithfully,

ROBERT WIGHT.

To

ROBERT COLE, *Esquire, &c. &c. &c.*

VIII.—*On the Structure and Habits of the Elanus Melanopterus.— By* B. H. HODGSON, Esq. *British Resident in Nipal.*

TO THE EDITOR OF THE MADRAS JOURNAL.

SIR,---The following details relative to the structure and habits of Elanus Melanopterus will prove interesting to all persons engaged in the noble attempt to classify birds according to their natural affinities, or, in other words, according to their essential conformation and manners.

Whether this attempt will *succeed* in the hands of such as, for the most part, have no adequate means of knowing more of habits and economy, than can be gleaned from the random notices of merely casual observers, nor any more of structure than can be elaborated from dry skins, remains to be seen. But I return to my subject.

MILVINÆ.

Genus. ELANUS.

Species. ELANUS MELANOPTERUS.

The *Chanwa* and *Chanwa Musaher* of Hindosthan.

Form. The female is 13 inches long, by 35 in expanse of wings, and $8\frac{1}{2}$ oz. in weight. The male is about 1 inch smaller, and seldom weighs above $7\frac{1}{2}$ oz. Both have the same aspect. The following is a detail of the dimensions of a male:—

		inches.	*parts.*
Tip bill to tip tail		12	$\frac{1}{2}$
Bill, length, from gape		1	$\frac{1}{16}$
Bill, length, from brows		0	$\frac{13}{16}$
Bill, basal height		0	$\frac{10}{16}$
Bill, basal width		0	$\frac{15}{16}$
Length of tail		5	$\frac{1}{8}$
Expanse of wings		34	0
Length of a closed wing		10	$\frac{1}{2}$
Length of tarsus, to sole		1	$\frac{7}{16}$
Length of central toe	exclusive of talons.	1	$\frac{2}{16}$
Length of inner fore toe		0	$\frac{13}{16}$
Length of outer fore toe		0	$\frac{11}{16}$
Length of hind toe		0	$\frac{9}{16}$
Length of hind talon (straight)		0	$\frac{11}{16}$

The bill, from the gape, is as long as the head, that is, actually long: but from the brow it is more distinctly *short:* a peculiarity caused by the width of the mouth and by the advanced position of the frontal plumes. Both the bill and the head, from the nares to the occiput, are distinguished by great breadth; but the bill, before the nares, is much compressed and feeble. The bill is slightly curved from the base; its hook is long and sharp; its upper mandible has a conspicuous accipitrine festoon; and its lower one is rather abruptly truncated but not notched. The cere is of mean size, and is nearly hid by soft curling hairs which radiate from the four angle of the eyes and clothe the lores and orbits: the nostrils are oval, longitudinal, lateral, with a full and free membranous edge on the upper margin. The eye is large and is furnished with a conspicuous salient opercule. The wings are very ample, and usually exceed the tail by $1\frac{1}{2}$ inch. Next to their length, their chief feature is the breadth and softness of the webs or vanes of the feathers. The second quill is invariably the longest; and the third is longer than the first, the former being about $\frac{3}{8}$, and the latter $\frac{5}{8}$, of an inch less than the second. The primes exceed the tertials by more than a third of the entire length of the former. The

first quill is moderately notched on the inner vane, about $1\frac{1}{2}$ inch from its point: but the notch is less strong and more remote than in Falco. The scapulars are usually about $1\frac{1}{2}$ inch shorter than the tertials. The tail is short, and, like the wings, noticeably soft, as is, indeed, the *whole plumage.* The tail is, upon the whole, nearly even; but there is a slight gradation from below in the extreme lateral feathers, and another from the centre above. The latter seldom exceeds half an inch, but still the tail may be said to be somewhat forked, though there be scarcely a trace of the divaricating structure, even in the extreme feathers. Shortness and thickness are the characteristics of the legs and feet: but the thickness is of that sort which the vulgar call 'gumminess'—not nervous strength. The tarsi are half plumed in front; their residue, and the toes, being very finely reticulated, with the exception of three digital scales next to each talon. The toes are short, unequal, and cleft, but the outer one, though free, can only act in front. The chief feature of the digits is the excess in length of the inner over the outer fore one. The central one has the average superiority over the others in length; and the hind one is just half as long as the central, or somewhat short but broad and stout. All the digits have nearly the same thickness. The soles of the feet are full and rounded, soft and unballed. The talons are sufficiently large, strong and acute; the inner and hind being equal; the central as long almost but feebler; and the outer fore, much the smallest. All the talons are rounded below, but none of them are compressed.

The ear, as well as the eye, is very noticeably large; and the gape reaches to the centre of the eye or more. The breadth of the head, and of the bill near it, have been already noticed; and these features, together with the amplitude of the wings, and the shortness of the tail and feet, seem to indicate (in the language of Mr. Swainson) a Natatorial or Fissirostral type. And, as there cannot, I suppose be *two* such types in the circle of the Milvinæ, it is difficult to imagine how Nauclerus and Elanus can continue distinct in this single circle.

But what the manners of Elanus? The birds of this genus are not, in India, migratory: they breed on (not in) trees, laying usually from 3 to 5 eggs in April, May, and rearing commonly from 3 to 4 young. The Chanwa or black wing quests chiefly in the morning and evening, feeding upon small birds, insects and mice. It does not usually seize upon the wing, though its hunting be, for the most part, by continuous questing. Commonly it is seen skimming the cultivation, like a Circus, occasionally poising itself on the wing for the purpose of getting a distincter view of some mouse, small bird or insect which has stirred on its beat and upon which, when clearly perceived, it stoops perpendicularly with the speed of lightning. After a while, it will resort to

some low roost, and, when relieved, commence another excursion, or perchance sit and watch there for its prey. Its forward flight is easy, low, and silent, but very effective in evolution when exertion is required to capture such nimble game as mice, which constitute its ordinary food.

It frequently whips off insects from the stalks of standing grain, after the manner of the Brahmani Cheel or Haliœtus (!) Pondicerianus; and this feat is, of course, accomplished on the *wing*. I have also seen the Chanwa pursue cuckoos and sparrows with uncommon energy, but I never witnessed it strike a *bird* in the air. Like the type of Circus, however, the Chanwa doubtless *can*, and sometimes does, seize its feathered prey on the wing. So that its manners are, upon the whole, sufficiently Fissirostral: perhaps as much so as its Raptorial affinities will admit of. Analogies and affinities are very fine abstract terms, which the quiet Orientals would be puzzled to deal with. But, as these words really import no more than remote and near resemblance of form and habits, one can hardly resist the presumption that (strongly as *habits illustrate form*), so observant and ancient a people as the Indians have probably reached some general conclusions as to the true relations of the animate beings of their own country, such as may be, oft-times, more worthy of a philosophical attention than the conclusions upon the same matters that have been elaborated in Europe out of *dry skins*, by dint of inference from structure *so seen*, to habits *wholly unknown*.

Now, it is remarkable enough that the people have, for ages past, been wont to approximate the Elani to the Harriers, but still without confounding the two. Is there any warrant for this approximation? It would seem so: for, both are twilight questers, flying in the same manner and seeking the same prey (mice). Both have large eyes and ears, soft plumage, long wings, wide gapes, large nostrils nearly hid by radiating hairs, bills much compressed and feeble before the cere, but furnished with a long sharp hook and an accipitrine festoon. In several of these common attributes there is an equal and conspicuous tendency towards the Strigine model, which tendency seems to give fresh authority to that approximation of the two groups to *each other*, so long familiar to the people of India, though but yesterday, and still dimly, perceived by the towering ken of European science!

IX.—*Remarks on the Cultivation of Cotton; principally with reference to the finer Foreign Varieties.—By* ROBERT WIGHT, Esq., M. D. *&c. &c. &c.*

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The very general failure of nearly all the attempts made in 1832-3 to introduce the cultivation of American and Bourbon cotton into the Peninsula, partly owing to unfavourable seasons, partly to the bad quality of the seed, and not unfrequently from the improper selection of soils on which to sow, induced me to call the attention of the Agricultural Society to the subject at its last meeting. I was in consequence requested by it, to draw up for circulation, in connection with its late liberal distribution of foreign seeds, such instructions for their management as I might think would tend to secure greater success to the attempts now making. In compliance with this request, I have selected the following remarks from materials collected for a more general report on the subject, and trust that they will prove the means of preventing disappointment in some cases, and securing success in others. They divide themselves into two parts or sections, namely, first, an abstract of the most improved methods of culture as now practised, and secondly, suggestions for an experimental enquiry, which I think might be undertaken with a fair prospect of success, and the chance of introducing very great improvements, as I feel quite satisfied that in India we are yet far from having arrived at perfection in this branch of Agriculture.

With reference to the second section I invite communications, and to those who, so far go along with me as either to repeat the experiments I have now in progress, or who, acting on the same idea, think they can more advantageously arrive at the result, though by a somewhat different route, I will feel thankful for any information their enquiries may elicit.

With respect to the seeds either already distributed or in course of distribution, I have ascertained that, with the exception of the Egyptian, the Sea Island of 1836, and New Orleans of 1837 all are, upon the whole, good; the Bourbon, and the Sea Island of 1837, excellent. An easy and economical way of ascertaining their qualities is to soak a few from 10 to 12 hours in water, and then sow them in slightly shaded beds or boxes of loose moist earth: if good, they will generally begin to show themselves in three or four days after sowing. Those covered with a thick coat of fur are a little longer.

In the cultivation of Sea Island considerable attention to the soil and situation seems indispensable. Mr. Piddington in his paper on soils, has shown that a large percentage of calcarious matter is nearly essential to a good cotton soil, a result that corresponds exactly with the following account of the soil of the Sea islands, extracted from Dr. Ure's work on the Cotton Manufacture, vol. 1, page 101. "There is a long range of Islands lying between George Town in South Carolina, and St. Mary's in Georgia which extends from 32° 30′ to 30° of north latitude, through a space of 200 miles. These Islands were originally covered with live oak, and the other evergreens of a southern climate; they had been the abode of a particular tribe of the red men of the west, who were fishermen rather than hunters: the accumulatian of oysters, clambs, and other kinds of shells, mingled with the remains of the bones and pottery of the ancient Aborigines, is so vast as to fill every stranger with astonishment; and these calcarious matters had become intimately mixed with the sandy soil and decayed vegetables into a peculiar loam, of a light and fertile nature. A former colony of English settlers had made the shores of these islands the seat of some indigo plantations. It was upon two of these islets, separated from the continent by a few miles of grassy salt marsh, that the Sea-island cotton was first made to grow." Again, page 102 "It is within the district from St. Mary's in Georgia to George Town in South Carolina, extending not more than 15 miles inland, that the Sea-island cotton is still confined. Whenever its cultivation has been attempted, to the North, South or West, beyond these limits, a certain decline in its quality has been observed to take place." From this it would appear that the light coast soils are the most appropriate for this sort, and will be still better, when, from the vicinity of deposits of shells, copious supplies of calcarious matter can be had for manure.

The Upland Georgia, or short staple cotton, is not so exclusive in the selection of its soil, but it also prefers a loose grey or reddish, somewhat sandy loam, not liable to crack and gape during the hot season. This I consider of consequence, as I esteem it essential to success, in the cultivation of this variety in India, that we change the constitution of the plant from an annual to a perennial, or at least to a biennial, a change which the frosts of its native country prevent, but which we can have no difficulty in accomplishing, all that is required being, to cut down the plants after the crop is gathered, and allow the roots to lie dormant, until the setting in of the next rains revive them, when fresh ploughing and manuring will secure a second, and probably much better, crop than the first; such at least from analogy I judge will be the case. Some further remarks will be found on this subject in a subsequent page. Similar treatment I feel assured will convert our

annual into biennial, or perennial, shrubs,* if the hardening and cracking of the black clay soils in which they are grown do not prevent by too severely injuring the roots. But I rather think the annual character is mainly attributable to the stems being left vegetating after the crop is gathered, by which the strength of the root being exhausted through the constant and severe drain at the time it should be allowed to rest, it is no longer capable, on change of season, of producing a remunerating return, and is consequently extirpated to make way for a more profitable employment of the ground.

As in the cultivation of cotton the broadcast method of sowing is radically bad, advantage should be taken of the introduction of a new kind, to establish with respect to it, at whatever cost, drill husbandry, for if found advantageous, it will extend to the original country variety (which from the soil it affects can never be entirely superseded) and might be the means of enlarging and improving the produce. With this view the seeds should be sown in shallow furrows about 4 feet apart, and the plants afterwards thinned out to two or three feet distance from each other, according to the fertility of the soil and probable size of the bushes. Many advantages would result, the ground could be easily hoed and kept clean, and the crop gathered without injuring the bushes. If, as the natives almost invariably do, light crops are sown in the same field, they, by being also sown in rows, could be easily kept from injuring the cotton plants, either during their growth or while reaping them. The bushes would have room to grow to their full size, and produce individually much more cotton with less exhaustion to the soil. When well grown, say from two to three feet high, the ends of the branches should be lopped. This operation, by checking vegetation for a few days and allowing the plants some rest and time to harden their young wood, will be followed by a copious supply of new shoots, and, as they alone bear flowers, a greatly augmented crop. After the crop is gathered, vegetation should as much as possible be checked. The easiest way to effect this is to strip the bushes of their leaves, by eating them down with sheep or cattle, by which the ground is at the same time manured, and then cut down the stumps almost to the ground in imitation of the Persian method. The roots are thus saved from the exhausting efforts they otherwise make to support vegetation in the stem during an unfavourable season, after the previous exertion of maturing a crop. In this way they may last many years, and allow

* "The shrub cultivated as an annual at Malta, under the incorrect title of *Gossypium herbaceum*, may under certain circumstances last for several years. Thus the cotton-growers at Motril in Spain raised many of their cotton plantations from Maltese seeds, and yet they found the shrubs live for six or even ten years. This change of the longevity of the plant is partly due to husbandry and partly to climate." *Ure, vol.* 1, *p.* 58-59.

besides a good crop of grain to be reaped annually from the same ground.

With respect to cleaning, it may be observed that the long staple cottons are easily separated from the seeds usually, and it is best done by the roller machine, which does not injure its delicate fibres. The short staples, on the contrary, are very difficult to clean, and for them the saw gin will be found by far the most economical method of proceeding, their fibres being so strong as not to suffer, or but slightly, from its rough operation. Our country white cottons, especially the finer sorts, are allied to the long staples, and like them are seriously injured by the saw. The nankin or red cotton, a short staple, and perhaps some of the coarser whites, will bear it well. For freeing fine Bourbon I would recommend caution in its application, as I think there is much reason to fear its doing harm, and if used at all, should have a slower motion than in cleaning short staples.

The following suggestions for an experimental enquiry having been written before these memoranda were even thought of, will account for the occasional repetitions which I have not thought necessary to change.

An opinion has long prevailed among cotton cultivators, that the plant must not be removed from the spot on which the seed germinated, nor even the soil be hoed or loosened to such a depth as to injure or interfere with its delicate fibrous roots, under the supposition that such removal or injury will certainly destroy the plant. This opinion being contrary to all analogy with the rest of the vegetable kingdom, and at variance with some well known facts, such as the ploughing of cotton fields when the plant is a month old, to clean the ground and thin out the superfluous plants, currently practised in this country, it is desirable to ascertain whether or not it is altogether founded on speculation. As a question of vegetable physiology it is interesting, but, in an agricultural point of view, it becomes one of great importance, especially to this country, where the cotton cultivation is so dependent on the regular periodical changes of the monsoons, as materially to interfere with any deviations from the usual routine of culture we may wish to adopt not having reference to these changes.

For example, the seed is usually sown after the first burst of the monsoon is over, and long before the plants are full grown the dry weather has commenced, and is far advanced when the crop time arrives, whence, owing to the previous operation of protracted drought and heat, vegetation is arrested previous to the plants attaining their full size and strength, to resist the united influence of these agents. In this comparatively stationary condition they begin to blossom, and, there being no regular succession of new shoots to keep up the supply of flowers, soon cease bearing, and give but a small return for the pre-

vious outlay and labour bestowed on their culture. Could not the interference of art effect a beneficial alteration by so modifying the growth, as to allow the plants to attain greater maturity previous to flowering, thus fitting them longer to resist the drought and heat of the bearing season, and in an equal ratio increase the produce?

If the opinion stated above be found correct in practice, the plan I am about to propose for the attainment of this object will fail, but not believing it well founded, or rather indeed knowing it to be erroneous, at the same time esteeming it a duty incumbent on us to endeavour by every means in our power to augment the produce of the soil, more especially by teaching the natives improved modes of agriculture, I can have no hesitation in recommending the method for trial; the more so, as the requisite, trials to determine its value, may be made at a very small expense, and, if successfully, may with an inconsiderable increase of cost and labour lead to greatly augmented returns.

The prevalent practice in the cultivation of cotton is to prepare the ground by repeated ploughings after the first rains have loosened the surface, and wait for sowing, in some districts until the setting in of the petty monsoon in July, in others till October or November, when the first burst of the North East monsoon is past. From five to seven months after, the harvest begins, and lasts from one to two months.

With the view of ascertaining the relative advantages of late and early sowing, I constructed from the district reports the second column of the accompanying table, from which however no very satisfactory conclusion can be drawn, as the differences of seed-time seemingly depend on local variations of season in the different districts. In all, with the exception of Vizagapatam and perhaps Ganjam, the, in my opinion, objectionable system prevails, of allowing the plants to flower without a check before they have obtained sufficient maturity, or their roots have acquired that strength and diffusion, requisite to enable them to resist the drought of the dry season.

The method by which I propose to obviate this objection is the introduction of transplanting, a system so generally prevalent in native agriculture, and its advantages so well known, that it is not likely to meet frivolous or unsubstantial opposition.

In herbaceous vegetables "transplanting has the effect of increasing the proportion of fibrous relatively to their ramose roots, by which it is found to increase the size and succulency of their leaves, flowers and fruit." I anticipate other advantages. I think it will produce hardier and stronger plants by the check to vegetation which it will cause, allowing time for the first layer of wood to harden, and by conferring on the plants a somewhat biennial character, cause a larger formation of new shoots, on which the crop depends, and with them the produc-

tion of cotton at an earlier stage of the hot season (while the ground is yet moist), a prolonged harvest, and an augmented crop.

The plan I am pursuing, in a series of experiments undertaken with the view of determining the probable success of the method, is, that of sowing the seed in beds, from which they are afterwards to be transplanted into the open ground with the first favourable change of weather. In my experiments I fear it will turn out that the sowing was too early (end of March and beginning of April), and that the plants will have attained an inconvenient size before such a change can be anticipated, but I imagine from a month to six weeks old, will be found a good age for removal. In transplanting, one of two methods might be adopted, especially where the English plough is in use, namely, either by laying the plants in deep furrows (the root should be extended its full length) four feet apart, or by the holing system. The holes should be two or three feet distant and six or eight inches deep, equal to the full length of the root. In this way they would be planted regularly, and at such distances as to permit free access for weeding, hoeing and gathering, without injuring the bushes, while they would be prevented choaking each other, and injuriously exhausting the soil by being too thickly sown.

In most parts of the country it is the native practice to sow grain among the cotton plants, and it is said without injuring the cotton crop. Should this, on careful comparative trials, be found not injurious, the practice would be greatly facilitated by the transplanting system. Green crops of the larger kinds of dry grain might be very conveniently taken and dried, and stored like hay for provender ; the want of which in most cotton countries is much felt, while it is known that no kind of dry forage is more nutritious or more relished by cattle. The cotton itself might also be expected to prove better in quality, as well as more in quantity, from being the produce of vigorous and well matured plants.

These sanguine expectations are, it must be confessed, in a great degree, but not altogether, speculative, for in the Vizagapatam collectorate, where liberal pruning is practised, the return is much greater than in any other district. This operation acts much in the same way, by, in the first instance, checking vegetation, which is followed by the production of numerous new shoots and abundance of flowers. There the annual cotton plants, when about three months old, are freely pruned, while the bushes of the triennial sort are cut down nearly to the ground the second and third years, and the produce is said to amount to 46 maunds or 1150 lbs. of seed cotton per acre, nearly equal to the best, and exceeding the ordinary, American crops. In Ganjam the same course, though not stated, seems to be pursued, since the amount

of produce is the same,* though the soil is thought inferior, while in Trichinopoly, the next highest, with a fertile soil, 31 maunds 8 lbs., or 783 lbs., is the greatest return, which, though so much less than the above, is still more than double the average return from the neighbouring districts of Tanjore, Salem, Coimbatore, Madura and Tinnevelly. The agriculturul processes are not detailed. From N. Arcot, Bellary, and Cuddapah, the two last the principal cotton districts of the peninsula, no reports have yet been received.

A slight inspection of the table will show that, in selecting the time for entering on the experiments here proposed, we are not to be guided by the Calendar, but by the local variations of the seasons, the principal of them being, to have well grown plants ready to transplant at what is now the usual season of sowing, with the view of ensuring a continued production of new shoots and flowers through a period of several months, an effect, that will be still further secured by occasional topping the extreme branches during the operations of weeding and hoeing.

Hitherto I have supposed the annual varieties the ones under trial, though I consider the plan equally, or rather more applicable to the foreign sorts. But with respect to them something more may be done. In the districts where the Bourbon and American kinds are in cultivation, I would recommend that one or two fields, which have already produced their usual rotation, and are about to be ploughed up, should be opened to the grazing of cattle and sheep, and when they have taken all they can get from them, to have the woody stems cut down to the roots, the land well ploughed between the rows, and then left to produce a fresh crop of shoots on the return of the rains. The fourth crop of Bourbon cotton from the same roots is now usually considered scarcely worth the trouble of collection, and the American is cultivated as an annual, but might thus I apprehend be rendered biennial, or even perennial. In Persia we are told that the practice here recommended is annually practised, and that the same plants so treated, last many years (20 or 30), the land every season producing besides a crop of grain. If in this way we can get only one or two additional good crops from the same roots, a great saving would be effected, as it must cost much less to plough and manure the ground in this way, than to root out the old plants, allow it to lie fallow for a season, and then re-sow. The great size, and the depth to which the ramose roots must have previously penetrated, will have placed the greater part of them beyond the reach of injury from the plough, and the new fresh manured soil with which

* The collector has since informed me that this is a mistake, originating in the uncleaned or seed cotton having by an oversight been noted in the column for cleaned.

the more superficial series will be brought in contact, will draw from them an abundant supply of absorbing fibrous ones. The Persian practice seems to confirm the American belief, that cotton is not an exhausting crop, and that the rotation crop taken there every third year, is not so much to relieve the land as to prevent a disposition which cotton has to generate insects and blight, which in Persia the annual crop of grain seems to obviate.

It seems of importance to ascertain whether a practice such as here recommended can be introduced successfully, since it might be the means of establishing more extensively the method of pruning, which I have already shown to be so advantageously adopted in the Vizagapatam district, but which in other districts is scarcely if at all known, by proving to demonstration, that so far from being injurious to the plant, that it may be boldly cut down to the root with evident advantage. To this it may be added, that if the country cotton plant was so cut down after gathering the crop, and the roots relieved from the exhausting and destructive effort to support vegetation in the stems, at a most unfavourable season, that they might be made to produce a succession of remunerating crops, allowing the ground at the same time, to be as freely employed for the production of annual crops of grain, while the new stems of the cotton plant are growing, as if nothing else was there; thereby, as has been done in Persia, Spain, Sicily and the Levant, in all of which, the same species seems to be the one cultivated, changing the constitution and habit of the plant from that of a small annual to a perennial.

In submitting these hints, with the view of requesting the aid of the Revenue Officers to carry into effect the required experiments to determine their value, it does not appear advisable that they should be undertaken on an expensive scale; such a proceeding is not necessary to establish the principle if correct, and failure in such a case might be productive of serious injury, by discouraging further attempts at improvement.

The method I am pursuing is to sow samples of a variety of different kinds of seed (communicated by the Madras Agricultural Society) in beds eight or ten feet square. The plants, with the exception of a few to be left for comparison, will be planted out when the rains set in. In all other respects the usual methods of agriculture will be adopted, and the result carefully noted.

In preparing the seeds they were soaked in water ten or twelve hours previous to sowing, a proceeding which probably tended to make them vegetate quicker, but is not necessary. Of the kinds sown, were two samples of Sea Island, one received in 1836, the other 1837; the former entirely failed, while nearly every seed of the latter has vegetated: two samples of New Orleans marked 1836 and 1837; the latter

has entirely failed, the former succeeded: two samples of Upland Georgia, 1836 and 1837; the former has partially failed; one of Bourbon succeeded perfectly. One of Egyptian 1837, entirely failed; a few seeds of Egyptian, communicated by Mr. Liddell from plants raised in his garden, some with downy, others with smooth seeds, both have vegetated: a few seeds of Pernambuco (?) gathered by myself from a tree in Bangalore, all vegetated. These examples show that much disappointment may be prevented by thus testing all foreign supplies of seed, before sowing them on a large scale.

The soil in which they are sown is a light grey sandy loam, the soil in which they are afterwards to be planted is of the same kind. But, to do justice to such an experiment, different soils should be selected, not only for the different kinds, but for each kind, as some may succeed well in some soils and fail in others. It is already known that the Bourbon and American varieties thrive in red, sandy, calcarious, also in light sandy grey, and in alluvial, soils, but altogether fail in the black cotton soils, which the country variety prefers. The Sea Island and Upland Georgia have been successfully tried on the saline sandy soils of the coast, both at Bimlipatam and Ingeram (at the latter of which places, the Bourbon had previously signally failed), and produced an abundant crop of fine cotton. The coast soils generally contain a considerable admixture of calcarious and saline matter. Such are the soils of the Sea-Islands, and so tenacious is that kind of proximity to the coast, or as it is said in America of a "saline atmosphere," that much of its good qualities are lost by removal twenty or thirty miles inland. On such, therefore, our experiments ought to be most extensively (but not exclusively) tried, and such being in some degree the character of my garden soil, it is from that and the New Orleans I anticipate the greatest success. The Bourbon however also succeeds well in grey sandy soils, as I had an opportunity of observing at Bangalore, where it seems to thrive exceedingly well.

In conclusion, I beg to add that the experiments ought not to be exclusively under the management of Europeans, neither ought the poorer ryots to be called upon to take a share in them, unless ensured against loss, but as many as possible of the wealthy and intelligent native proprietors of every district, who can be made to understand the object and principle of them, should be invited to assist in them, as their (the native proprietors') success will prove a much more satisfactory standard of comparison and means of encouragement to the poorer classes, for whose benefit principally they are undertaken, than that of Europeans, however conclusive, and will tend much more to diffuse a knowledge of the plan, and its advantages, if any, by giving them constant opportunities of

examining the progress of the experiments in all their stages, and forming a correct estimate of the benefits likely to accrue. This they could not have, if confined to the gardens and compounds of Europeans. But they ought to be made simultaneously in both situations, for success in the one may demonstrate satisfactorily the causes of failure, should such happen, in the other, and suggest such repetitions and modifications in the successive steps of the experiments, as may finally lead to the most triumphant results, by eliciting information of the greatest value, towards improving both the quantity and quality of this most invaluable of vegetable productions.

There is another point of view, in which it is necessary to consider this proposal. One of the prominent defects of Indian agriculture is their neglecting to change the seed from time to time. Seed of the same stock is sown year after year on the same grounds, apparently in absolute ignorance of the advantages to be derived from change, and which is no where greater than in cotton cultivation; hence, we never hear of interchange of seed between different districts forming any part of the agricultural code of the Hindoos, but is one, which it is most desirable to establish, by proving experimentally its benefits. Spain, Italy, Sicily and Malta, each supplies itself with seed from its neighbour, and all benefit, though there is every reason to believe they were all supplied from the same original stock. Here it is probable the transplanting method will usefully come into play, for if finer and stronger plants are so reared, analogy teaches us that their seed will, even under the ordinary treatment, give a finer produce, and in this way advantage may be taken of the plan, intermediately, to improve the staple, even should it be found in other respects inapplicable to practice from the cost exceeding the profit.

In these remarks novelty is not aimed at: the practices recommended having all been successfully tried in different situations and circumstances; my object has been, merely to endeavour to reduce them to principles, under the idea that isolated facts, however valuable in themselves, never carry the same weight that they do when combined by a leading theory into a system. To lay the foundation of such a system is my wish, that I have yet even partially succeeded I am far from thinking, our disjointed materials being inadequate to the work, but if no other advantage results than that of proving the principles I have assumed inapplicable to practice, one step has been made towards ultimate success; and in the mean time, I shall continue the investigation which is here commenced, in the hope of ere long being able to produce a more satisfactory exposition of the principles which should guide us in cotton agriculture, than was possible within my present contracted limits.

ABSTRACT OF DISTRICT REPORTS.

GANJAM.—Method of cultivation not mentioned. Very little cotton is raised in this district, and would have been supposed of inferior quality, had it not produced much of the thread from which the Chicacole muslins are fabricated. The nature of the soil is said to be inferior for this kind of culture, and therefore that it would not be advisable to encourage the growth of cotton. This opinion is not borne out by the tabular return, and it seems probable, from the greatness of the produce (46 maunds of seed-cotton per acre), that, though the country cotton may be somewhat inferior, the American cottons may be profitably introduced.

VIZAGAPATAM.—Three kinds of cotton are cultivated in this district, namely, annual early white, triennial white, and red cotton. After the usual ploughing and manuring, the first is sown in June when the rains set in---when three feet high the tops of the branches are cropped---in the third month pods are produced, and in the fourth gathering commences and continues about forty days. 2d. The triennial white. This is esteemed the best, it is sown in alluvial soils near hills in June---the gathering commences in December and continues four months. The plants are afterwards cut down nearly to the ground, and when the petty monsoon begins the ground is well ploughed and manured, and sometimes a crop of light grain reaped before the cotton harvest begins. This process is repeated the second and third year, during both of which the plants are in full bearing. It is not stated whether, as in Coimbatore, two crops are gathered annually. 3d. The red cotton is sown on *ravutty* soil (described as sweetish), previously well ploughed, from September to the middle of October, in rows about a foot distant. When the plants are about a foot high, the ground is harrowed two or three times a week, and afterwards ploughed with a peculiar plough, called *goontroakah*, between the rows. They begin to bear in the sixth month, and continue bearing three months.

The peculiarity of culture in this district is the system of pruning, which, if the following statement is correct, is most advantageous. Of white cotton, a veesum of land, consisting of four coontahs, each forty-two feet square (= 7056 square feet or somewhat less than 1-6th of an acre), is said to produce 30, and, if on well manured *gooraopah* soil, even 40 maunds of seed-cotton. There must surely be some error here, as the district table gives 46 in place of 180 maunds to the acre, which this statement if correctly calculated implies. Some Sea Island and Upland Georgia seed, sown in gardens, succeeded well and produced fine cotton—these ought to be encouraged, especially the former, for coast culture, being easily cleaned and the method of cultivating triennial cotton being, there is reason to believe, equally applicable to it.

RAJAHMUNDRY.—Two kinds of country cotton are in cultivation, the white and red. The white is sown in well prepared rich black soil, and may be repeated annually, together with paddy seeds and coondooloo (cholum ?), early in June. The field is then ploughed again, to bring the seeds into regular rows, and harrowed with hurdles to level it, and afterwards weeded several times. The gathering is in March, April and May, the produce is about 12 maunds of seed-cotton per acre. The same plants often produce a second but inferior crop, and are said not to be injured by much rain. This seems to be a very unusual variety, and might be successfully tried on the Malabar Coast, the cotton plant rarely admitting of cultivation on soils capable of producing paddy, unless in the instance where the latter is grown in trenches dug between beds for the purpose of draining the soil intended for the other, which does not seem to be the case here, at least it is not so mentioned.

Red cotton.—This is sown in a waxy soil (stiffish clay ?), previously well ploughed—completely sandy ones do not answer. This kind of soil pays an assessment of only 2½, while the black pays about 6 rupees the acre. The sowing commences in October in furrows 8 (3 ?) to one fathom, the seeds about three inches apart. When about eighteen inches high, the ground is weeded, and the operation several times repeated, till April, when the harvest begins. In fair seasons the produce is about 20 maunds, or 500lbs. of seed-cotton per acre, which, at the rate of sixteen rupees per candy, leaves a profit of ten rupees to the cultivator.

This variety seems well suited for culture in the hottest and most arid tracts of the interior, from its astonishing power of resisting heat and drought. The produce being always great in proportion to the continuance and intensity of the hot land winds, but does not give a second crop. It is afterwards stated the rows are two feet apart. I presume the latter is correct.

GUNTOOR.—In this district drill husbandry is adopted in the cultivation of cotton. Country cotton is sown in preference in black soils, but is not confined to them—the rows are about four feet apart, and the plants from one and half to two. The same methods and soils were tried for American and Bourbon cottons, but both failed, principally it is supposed owing to the heat and want of rain that season, but perhaps partly also owing to the injudicious selection of soil. Contrary to what takes place in Rajahmundry, the sea breezes are said to cherish and improve the plant, while it shrinks under the stroke of land winds and fails to give its crop. An interchange of seeds might benefit both.

The sowing takes place in August and September, the gathering commences in February, and is over by the end of March. It seems very desirable to repeat the trials with American and Bourbon cotton, the former on the calcarious saline soils of the coast, the latter on the gravelly and loamy ones of the interior.

Masulipatam—Nellore—Tanjore.—Neither of these being to any considerable extent cotton producing districts, the reports from them afford no information respecting the cultivation of the little that is produced. Nellore derives most of the cotton required for the supply of its manufactures from the Ceded Districts.

Trichinopoly.—At the date of the report from this district the cultivation of Bourbon cotton was rapidly extending, and promised soon to become general in those parts of the district that afforded suitable soils. It had altogether failed in the black soils, but succeeded well in reddish loamy sandy ones. Of country cotton two kinds are cultivated, oopum purthee and laudum purthee (no explanation are given of these terms, but I presume they mean the annual and triennial cottons, purthee meaning seed-cotton). The former is a coarse inferior sort, cultivated in black soils. The seeds are sown in November and December, and the gathering takes place in April and May. The latter is raised in both black and red soils and is of fine quality. It is sown in July and August and gathered in December and January, and sometimes produces a second crop. It is frequently mixed with other dry crops. It does not appear that the large produce of this district is in any respect indebted to superior husbandry, as no account is given of the plan pursued.

Salem.—The cultivation of both American and Bourbon cottons have been successfully introduced into this district, especially the latter, but it appears to me is still far from having attained perfection. This being so completely an inland district, the Upland American varieties only can be expected fully to succeed. The Sea Island and other coast varieties being so sensitive to removal from the coast, probably from requiring a soil strongly impregnated with saline matter, that they immediately deteriorate on being carried inland, will most likely fail, but should certainly be tried. The country cottons of this district are good, but afford only the moderate return of about 3 rupees per acre to the cultivator. The mode of culture, it would appear, presents nothing peculiar with respect to country cotton ; for Bourbon cotton Mr. Fischer recommends the best red loam soils at a distance from the hills, which he thinks are apt to attract rain and cause dews, which are injurious. The plants produce the best crops the second and third years ; pruning has not been practised at any stage. It would I think be worth trying the effect of the Persian plan on some spots both of the second and third years duration. The mixture of light grain crops in the cotton fields is constantly practised, and is said not to injure the cotton crop, but no comparative experiments have been made. The seed is sown in August and September, and the first harvest begins in May.

Coimbatore.—The very copious agricultural details from this district enable me to give a fuller account of it than of any of the preceding, or rather I should say renders it difficult to give a sufficiently condensed summary. There are several varieties of country cotton cultivated, but I shall confine myself to two, the annual and triennial, or oopum and laudum purthee, the former is cultivated in deep black, the latter in the lighter loamy calcarious soils. In the latter only the American and Bourbon cottons can be cultivated successfully.

The lands, previously manured, are prepared for the reception of the seed by repeated ploughings, after the first rains in April; but the sowing does not take place until August, September, or even October, according to the setting in of the rains, when, after two or three additional ploughings, it is sown broadcast, the seeds being previously soaked in cow-dung or red earth and water, and dried to prevent them adhering to each other in sowing. When about a month old, the ground is again ploughed with a light plough made without iron on the share, a proof that they are not so tender at this age as usually supposed, which at the same time weeds the ground and thins the superfluous plants. In about another month they are weeded again, after which they are considered sufficiently matured to resist the weather. The same methods are practised with the American and Bourbon cottons. In ordinary seasons the gathering commences in March and continues till the end of April. If rain falls about that time, the plantation is again ploughed and cleared from weeds, and in July and August a second crop is gathered, amounting to about half the first. In January of the second year these processes are repeated, and the two crops gathered as in the first, and again in the third year, after which the plants droop, cease to bear, and are rooted out before the setting in of the North East monsoon. If the soil is black it is re-manured and prepared for a fresh crop of oopum purthee, but if the plantation has been triennial, the land is fallowed or sown with some common light grain. The time for ploughing, sowing and gathering the annual, is the same as for the triennial, plant. Experiments were in progress, at the date of the report, for determining the comparative advantage of row planting, but have not yet been communicated. It seems probable much advantage would accrue from liberal pruning after each crop. The cultivation of Bourbon and American cotton is rapidly extending, and in some talooks has nearly superseded the indigenous triennial; the plan of culture being the same for both, and no advantage obtained on that account, its extension must be solely attributable to its superiority. The collector, Mr. Drury, thinks that if the cost, of conveyance to the coast for exportation was reduced, a further increase would take place, greatly to the advantage of the district.

MADURA.—The cultivation here is the same as that generally pursued elsewhere. The ground is repeatedly ploughed, and manured, in the usual way, by penning sheep on it, and at the setting in of the rains in September and October the sowings commence. The gathering season of the earlier sown is from January until the middle of April, and of the latter from February to May. The produce varies exceedingly in different talooks. In the northern parts of Ramnad it is only about 176 lbs. per acre. In Pallemuddum, another division, it is about 226; while in Terumungalum, the best cotton country of the district, it amounts to 391 lbs. and is of the finest quality, much of it being exported under the denomination of "Fine Tinnevelly," and, as I have been informed by a trader, is among the best exported under that name. Much of the light calcarious soils along the gulph of Manar will probably be found well adapted for the cultivation of American cotton, in which case the facility of export will give it a very decided advantage in bringing it into foreign markets.

TINNEVELLY.—In this, as in all the other districts, the black soils enjoy the preference for annual country cotton; the lighter loamy ones for triennial. The sowing commences at different seasons. In the north western talooks, between July and September, according to the weather; in the eastern from October to December. Both the Bourbon and American cottons are now cultivated to a considerable extent in this district, in light alluvial, and red, soils, apparently with much success, but the comparative advantages resulting from the foreign and indigenous sorts are only known to the cultivators. There appears, so far as I could discover, no peculiarity in the method of culture of either. It is probable much advantage will be found to result from the introduction of the Sea Island and New Orleans varieties on the coast, as there is every facility in procuring calcarious manure from the abundance of shells and madrepores to be found there. The latter are now sometimes used as a building stone, or burned for mortar, but, pounded, they would perhaps prove even more useful as a manure. Both these kinds may also, I believe, be introduced with success on the Islands off the coast, and thus render these barren wastes profitable farms. I would recommend this hint to the attention of those who have the opportunity of trying the experiment.

P. S.—After the preceding observations were in the printer's hands, I fortunately met with a report of a special committee of the Agricultural and Horticultural Society* of India, detailing a series of experiments, undertaken under its direction to determine

* Trans. vol. 2, Appendix.

the best methods of cultivating the American cottons, and the kind best suited for India. The results are upon the whole unsatisfactory, owing principally, the committee believe, "to our ignorance of the proper seasons for sowing; bad seed; and from the selection of land, rather forced upon the society and wholly unsuited to the growth of cotton, being *too rich* in most places, and *too salt* in others." The committee observe "This fact is so palpable that it hardly requires remark. It has shown itself in every progressive step from sowing the seed, to the last stage of cropping the cotton.

"1st. It has shown itself by the rapidity and luxuriance of vegetation in the production of abundance of wood, leaf, and flower, but little produce.

2d. By an almost unceasing process of blossoming, thereby exhausting the plant before it had attained maturity, and consequently deteriorating the staple in the ratio of excessive bearing.

3d. By the general result of short produce, an invariable sign of too rich and moist a soil.

4th. To another cause your Committee are disposed to ascribe failure, viz. an improper mode of planting."

The Committee also point out that broadcast sowing will not answer with the American plant. That the soil requires to be dug to a great depth, about 18 inches, the tap root extending nearly that length, and, if obstructed, checking its growth. This precaution cannot be so necessary in the light sandy soils I have recommended, as in the clay one of Akra, but, when cotton is cultivated in the best manner, must always be attended to. Transplanting was tried on one occasion, but without any beneficial result. The following paragraph I quote entire, as affording so pointed a confirmation from experience, of the plan I had advocated from analogy, and which will I trust be frequently tried, so as to leave no doubt of the advantages likely to flow from a systematic adoption of it in all kinds of cotton cultivation, to which experience may prove it applicable.

"Your Committee would beg your special attention to the following paragraph from Mr. De Verinne's letter to the officiating Secretary, dated Surdah, 5th August, 1835: "The out-turn of the last season 1832-33, shows a more favourable result, as 60 maunds of clean cotton and 180 maunds of cotton-seed, were gathered at the farm from December 1832, to May 1833. It must be recollected that the greater part of this cotton and seed was produced from 90 beegahs and 9¾ cottahs of Upland Georgia cotton cultivation, sown the previous season, the stumps of which only were left after the severe hail storm of the 25th and 26th March, 1832; these stumps threw out fresh shoots during the rainy season of that year; were partially pruned, and well hoed up at the conclusion of the rains, and yielded from December to

May, 12,963 lbs. of cotton, including seed, making an average per beegah (of 120* square feet), 144 lbs., which cotton after having been separated from the seed, gave 40½ lbs. of clean cotton, and 103½ lbs. of seed."

"The only tolerable crop in point of quantity (for the quality of the Upland Georgia cotton has been already declared excellent) has therefore been derived from the stumps of plants of the previous year, destroyed by the storm, and this simple fact involves a question of great importance, viz. *whether this description of cotton might not be more successfully cultivated as a perennial plant, under a course of treatment similar to that which Mr. Bruce describes as followed in Persia; where, after the goats and sheep have been allowed to browse freely upon the plants (after crop), the peasantry are permitted to complete the work of spoliation by breaking off the remaining branches to the root.*"

"The hail storm which occurred, and did so much damage to the plant in 1831-32, was the means of providing us with a tolerable crop in 1832-33, and really seems to point at the Persian *method, as an example* for others to follow in India."

The Committee strongly recommend the introduction of the Upland Georgia on an extensive scale, as affording cotton of as fine a quality as that produced in America from the same sort.

Regarding the table which accompanies, the following explanation of its objects and contents may prove useful. The first eight columns show the kind, the average produce, charges, and cultivator's profit on an acre of ground under cotton cultivation, also the time of sowing and gathering in each district: the ninth exhibits the number of square feet required in each to produce one pound of seed-cotton, calculated at the rate of 43,560 square feet per acre and 25-lbs. per maund. This method of examining the subject by bringing it better within the grasp of the understanding, and more forcibly contrasting the rate of produce, enables us to form a more correct estimate of their respective advantages and fertilities, and of the degree of encouragement that should be given to any particular kind of cultivation in each. The next four columns exhibit the agricultural charges, assessment, and profit on an acre of rice cultivation, and the number of square feet required to produce a pound of paddy at the rate of 23⅛-lbs. per mercal. The remaining four columns refer to dry grain crops. The numerous blanks in the last two sets originate in omissions of the district returns.

* This is surely a mistake, as it seems utterly impossible that nearly 58,000 lbs. of seed-cotton could be produced on a patch of ground the usual out-turn of which rarely exceeds 500 lbs., and which is said to produce an immense crop when it amounts to 1,000 lbs. At the rate of 14,000 square feet to the beegah 144 lbs. is equal to 1 lb. to 100 sq. feet and not 1⅓ lb. to the square foot.

I have experienced much difficulty in the construction of this table, from the prevalent, but not commendable practice among the Revenue Officers, of employing in their reports, under their local denominations, the weights and measures of their respective districts, often without appending any scale by which they can be reduced to the more uniform and better known English standard, whence, it is probable, errors will be found in several of the calculations.

The discrepancies, which the columns of square feet place in such a prominent point of view, are such as to lead to a suspicion that some of the returns are erroneous, for, if not, the obstacles to success in some districts are vastly disproportioned to those of others. As, however, it is by this kind of scrutiny that we are most likely to arrive at satisfactory conclusions, I cannot hesitate to add these columns; the more so, as they suggest an easy method of testing the produce, which may prove of great use in ascertaining the relative productiveness of different portions of districts, and possibly of occasionally relieving the burthens of some who may be over assessed, and equalizing those of others who are under-rated. Nothing can be more easy than its application to grain crops. The produce of a patch of five or ten feet square, of medium fertility, has only to be weighed, or rather measured, and the result, with the requisite allowances for inequalities of soil, watering, &c., applied to a greater or less extent according to local circumstances, will give a nearly correct average for the whole. If to this column I could have added the quantity of water required to irrigate the land during the ripening of a crop of paddy, an important point would have been gained, by enabling us to calculate not only the quantity of paddy annually lost from want of water caused by evaporation from tanks alone, but the value of every tun of water in a reservoir however large; and, lastly, how much we would gain by the substitution of deep and narrow tanks for the broad and shallow ones now in use, after deducting the additional cost of raising the water by artificial means, such as pumps, buckets, &c. worked by windmills, steam engines, or other mechanical contrivances for generating power.

[It is well known that, by an order of Government, dated 1st March 1836, Dr. Wight, the able and zealous author of the foregoing remarks, was appointed to enquire into the state of agriculture in Southern India, and to report on the best methods of cultivating cotton, and other most valuable products of this country, with a view to the more complete development of the resources of our Indian Empire; for, unless European skill and science are brought to bear on agricultural or commercial enterprizes, improvements are not likely to be effected. The Minute of Consultation, which accompanied the above named order, was highly creditable to the Madras Government, and contained a just tribute to the talent of Dr. Wight, the result of whose labours will no doubt be evident, in process of time, in the amelioration of agriculture, and in the increase and improved character of the products of the soil.

Science, in modern times, is not made up of abstract speculation and recondite theory, but is applied, in a practical manner, to the every day purposes of life, for the general good of mankind and the advancement of civilization. A visionary search after the philosopher's stone has been discontinued, and the industrious cultivation of the natural faculties, has taught the true secret of transmuting the sordid things of the earth into gold, by that knowledge, an alchemy worth knowing, which multiplies and improves the arts and manufactures, and with them the rational enjoyments and the comforts of life. Thus the applications of science, as well as its theory and principles, are eminently suited to the pages of this Journal, and, in this light, we hail Dr. Wight's contributions as most valuable. If any other argument was necessary to prove their suitableness, we need only adduce the fact of the Royal Asiatic Society having formed a Committee of Agriculture and Commerce, expressly for the furtherance of objects like that which constitutes the subject of this paper; thus declaring (what seems hitherto to have been lamentably lost sight of) that the objects and purposes of an Asiatic literary and scientific institution, are not solely investigations into the literature, antiquities, history, and opinions of Asiatics, but also the infinitely more important one of holding up the lights of European science to dispel the mental and political darkness of the East.

While the labours of Dr. Wight are thus mainly directed, as a public servant, to the improvement of agriculture and commerce, and to the acquisition of a knowledge of the statistics of our empire in India, botanical science is, at the same time, incidentally advanced; for wherever the foot of this ardent botanist is planted, new additions to our flora are

(See page 100.*)*

COTTON.

Districts.	Kind of cotton.	Produce with seed per acre.		Charges.			Assessment.			Profit.			Sown.	Gathered.
		M.	lbs.	R.	A.	P.	R.	A.	P.	R.	A.	P.		
Ganjam......	C. cotton.	15	0	10	0	0	2	8	0	10	0	0	December ..	June to September
Vizagapatam	C. cotton.	46	0	18	8	0	14	0	0	12	8	0	June	November........
Masulipatam	C. cotton.	8	0	2	11	6	2	11	7	0	8	11	Unknown ..	Unknown.........
Rajahmundry	C. white cotton ..	15	3	4	8	0	6	15	0	0	10	6	June.......	March to May.....
Do.	C. red cotton. .	20	0	4	8	0	3	0	0	8	8	0	October	April ....
Guntoor......	C. cotton.	10	0	1	11	8	1	9	8	1	10	8	September..	Feby. to March....
Tanjore......	C. cotton.	16	14	15	7	6	0	7	6	3	8	10	January	May and June ....
Trichinopoly	C. cotton.	31	8	8	6	6	5	5	5	9	14	1	Nov. & Decr.	April and May....
Salem	C. cotton.	14	0	6	0	0	5	0	0	3	0	0	June to Sept.	1st crop Feb. March. 2d do. Nov.
Do.	Bourbon cotton ..	15	0	6	8	0	5	0	0	3	8	0	May to Octr.	1st crop Oct. 2d do. Feb. Mar. & Apr.
Coimbatore..	C. cotton.	12	18	5	0	4	1	8	8	2	6	0	October.....	Feb. to Apr. & again in Aug.
Do.	Triennial cotton ...	11	12	3	13	11	1	8	8	2	9	5	Aug. to Octr.	1st year Aug. to Sep. 2d do. Feb. to April, 3d do. Aug. to Sept.
Do.	Bourbon cotton..	10	17	3	15	4	1	8	8	3	0	0	ditto ..	
Madura......	C. cotton.	15	15	6	10	8	1	14	7	7	0	11	Octr. & Novr.	Feb. Mar. & April.
Tinnevelly...	C. cotton.	11	3	5	4	0	2	1	7	2	1	8	July to Decr.	January to June...

(1) Black paddy—(2) White paddy—(3) The mean of Shembapeshanum and Caur paddy—

N. B.—The blanks are omissions in

Soil.	No. of square feet required to produce 1-lb. of cotton.	Nunjay Grain. Paddy. Charges.	Nunjay Grain. Paddy. Assessment.	Nunjay Grain. Paddy. Profit.	No. of square feet required to produce 1-lb of paddy.	Punjay Grains. *A* Cumboo—*B* Jonna—*C* Tennay. Charges.	Punjay Grains. Assessment.	Punjay Grains. Profit.	No. of square feet required to produce 1-lb. of	
	sq. ft.	R. A. P.	R. A. P.	R. A. P.		R. A. P.	R. A. P.	R. A. P.		
Unknown.....	$116\frac{1}{6}$	—	—	—	—	—	—	—	—	
Unknown.....	$37\frac{7}{8}$	9 14 0	14 0 0	6 2 0	$37\frac{7}{8}$	—	—	—	—	
Black soil....	$217\frac{3}{4}$	4 15 0 4 9 8	4 6 9 7 13 8	1 9 1 6 14 7	120 (1) 72 (2)	3 11 10	4 5 10	1 9 2	180	*(B)*
ditto	$115\frac{1}{4}$	—	—	—	—	—	—	—	—	
Waxy sandy soil.........	$87\frac{1}{9}$	—	—	—	—	—	—	—	—	
Black soil.....	$174\frac{1}{4}$	—	—	—	—	—	—	—	—	
B. soil........	$105\frac{1}{5}$	5 1 8	5 4 9	1 6 11	$65\frac{5}{12}$(3)	1 11 2	1 0 5	0 4 5	33	*(A)*
B. soil........	$55\frac{5}{8}$	—	—	—	—	—	—	—	—	
B. soil........	$124\frac{4}{9}$	9 14 9	7 15 0	2 0 0	$272\frac{1}{16}$	2 12 10	2 2 9	0 2 0	$47\frac{1}{2}$	*(C)*
Red soil......	$116\frac{1}{6}$	—	—	—	—	—	—	—	—	
Black soil.....	137	—	—	—	—	2 1 5	1 6 0	0 11 2	$104\frac{31}{48}$	*(A)*
Red loam mixed with limestone and sand.	$151\frac{7}{9}$	—	—	—	—	—	—	—	—	
	$163\frac{1}{7}$	—	—	—	—	—	—	—	—	
Black soil.....	$111\frac{1}{16}$	5 4 8	3 15 6	1 2 5	$21\frac{1}{8}$	3 4 4	1 5 11	1 1 4	$35\frac{1}{24}$(5)	*(A)*
Black soil.....	$156\frac{1}{46}$	7 7 0	14 3 0	6 12 0	$10\frac{7}{18}$(4)	3 10 5	2 1 7	0 11 6	$35\frac{1}{5}$	*(A)*

(4) The mean of Peshanum and Caur paddy—(5) The mean of six different soils.

the district reports.

made known, and, independent of the advantages enumerated above as accruing to agricultural and commercial operations, the Government is bestowing a great and lasting benefit on science by his employment in his present capacity—which, we earnestly hope, he will be permanently fixed in. This expression of our desire we know will be responded to by the world of Science in Europe, where the exertions of Dr. Wight are most eagerly watched and duly appreciated.

But to return to the paper on the cultivation of cotton. The first part has been sent in the form of a Circular to the Collectors of districts, and the supplement, which has just been communicated to us, will be added thereto.—EDITOR.]

Supplement.—I have been favoured with two valuable letters from Mr. Fischer of Salem, the only European in these provinces personally engaged on a large scale in cotton agriculture. These letters, so far as they refer to that subject, I have thought it advisable to publish; partly for the sake of the information they convey, and partly on account of the opportunity they furnish of extending my own remarks to some points not touched upon in the foregoing remarks.

" With regard to your Cotton Circular I do not think I have much to say on it. Among the causes of failure of the attempts in 1832-33, you omit to mention two main ones, viz. the improvidence of Government, in keeping the seeds lying in their godowns, until they were almost entirely spoiled, and in distributing them in an injudicious manner. You are besides wrong as to the season for sowing the Bourbon and other finer cottons. They should be sown as soon after the rains of April and May as possible, and may be sown till August; but to do it after that would ensure failure. The Bourbon cotton, and all the American kinds I have tried, yield three crops a year, and last for five or six years. One crop from the April and May rains; a second from the July and August rains, and a third crop after the monsoon. This last is the chief crop—I am speaking of old plants; new plants sown in May do not yield till the following February. The ryots hereabouts do not care about soaking the seed before sowing, but they are particular in cleaning it of its adhering wool.* This is done by mixing it in a thick solution of cow-dung, drying it in the sun, and then rubbing it between the palms of the hands.

" I have been particular in destroying all my Georgian or Upland cotton seed plantations, because I found the plants not so productive

* This should be attended to: many of the small quantity of seed sown by me were lost, owing to the woolly fur not having been removed previous to sowing.—R. W.

as my Bourbon, and the produce not so good in quality, nor so valuable in price. The Sea Island, which I introduced the last three or four years, has got mixed with my Bourbon—indeed I think the two are one and the same kind, and that that grown (in America) is superior from superior culture, soil and climate. Nothing will induce the natives to take more trouble with it in this country than they can possibly help. The Sea Island seed, which I introduced within the last six or eight months, I am taking great pains with, and am keeping it carefully separate."

"I got your letter yesterday, on my return from Mooganoor. To save your next edition of the Cotton Circular from as many errors as possible, I hasten to set you right on two points wherein you err. First, if I said the Georgian cotton did not answer so well with us as the Bourbon, for I forget the terms I used, I did not mean in point of growth, for it grows equally well, but I meant in respect to quantity of produce, and value of said produce in the English market. My Bourbon always sells some pence higher than all the American Uplands, and the Bourbon plant, as far as I have been able to judge from my experience in the interior, and the experiments made by Major Sim at Madras, which were not a few, is a hardier and more productive one than the Georgian. The second point is, that all my experience, and I have Georgian plants of the third generation, in different soils too, is adverse to your notion, that this kind of cotton passes into the Sea Island kind in the course of time,* by change of soil and climate. I can easily conceive that this error arose from the mixing of seeds, which I know it requires great care and trouble to prevent. Nor does my supposition that the Bourbon is degenerated Sea Island at all support such a notion. Why, one has a black smooth seed, and the other a green woolly one, and the quality of their fibres is different. You may be assured the one will no more change into the other, than an European to an Indian, or *vicê versâ*, by change of soil and climate.

"I do not know the Egyptian cotton; without it is that which we did not know in my garden, and which we called vine leaf cotton, from something we saw one day in the Bengal Agricultural and Horticultural Transactions. I send you a little of it in the accompanying

* Mr. F. has misunderstood my meaning, for, in saying that the two kinds are said to be convertible under certain circumstances, I never for a moment supposed that those suited to change Upland into Sea Island were to be found in Salem. On the contrary, I stated that the very reverse was more likely to happen by the Sea Island deteriorating. That long staple cotton should degenerate, and become short, is not at all wonderful, when sown in an unfavourable soil and climate; neither do I think the other is so in opposite circumstances. We daily meet with such changes, and the whole science of agriculture is founded on the susceptibility of plants to undergo them.

packet to tell me if it is so.* If this is Egyptian cotton, it is one of the largest staple I know; the cotton itself is dingy and not very fine, but that may have arisen from my having planted it out of season. We shall see how this year's produce is—I do not know where I got the seed. The plant you may remember is not so shaggy or shrubby as the Bourbon. Finally, my argument is, that, if the Sea Island seed answer with us, as I have ascertained it does, why take the same trouble to introduce an inferior sort, that will introduce a superior one?"

"We do practise the Persian plan you recommend, more or less, according to the zeal and industry of the cultivator, but they all know its value, indeed in most cases it is absolutely necessary."

I the more readily introduce the above extracts, as they afford satisfactory evidence of a progressive improvement in the Salem and Coimbatore districts, in the method of cultivating this valuable plant; as may be seen by contrasting them with the following extracts from some directions drawn up by Mr. Fischer in 1826, and communicated to the then Principal Collector of Coimbatore: a copy of which he gave me some months ago while in Salem.

"The seed should be committed to the ground in the month of August"—"the plants bear in the month of May of the succeeding year, and do not require to be removed for two or three years or more"—"I have endeavoured in vain to prevail upon the natives to prune the plant when a month or two old, and again after the cotton seasons, which I am convinced would be of infinite service to their growth and fertility."

From these extracts it will be perceived that, ten years ago, August was esteemed the best time for sowing. In the interval it has been ascertained that, unless the sowing be completed by August, it will ensure failure, and that the most advantageous season is immediately after the rains, in April and May. This is certainly a point of importance to know, since it appears that much of the failure of the Calcutta Akra farm experiments, was attributed to ignorance of the proper time of sowing.

It does not appear that, in the earlier attempts, more than one crop was gathered annually: three are now currently taken. At that period nothing would induce the ryots to prune after the cotton season; but now it appears they have discovered that the rough, but economical, method of pruning, practised in Persia, is an improvement, and

* The sample sent is not Egyptian; it looks more like Pernambuco. The true Egyptian is scarcely, if at all, distinguishable from Sea Island; and is supposed to have been imported from America. R. W.

practise it accordingly. Then the plants lasted three years, now they continue five or six years. How far we are indebted to my paper for eliciting these facts I am not prepared to state, nor indeed is that a matter of the slightest importance, so long as we get them; I have therefore only to add, that it will afford me much pleasure to receive many similar communications from all parts of the country, as so many practical confirmations of the justness of the views I had deduced from a careful consideration of broken and detached notices, met with in books, or picked up in conversation.

The opinion expressed in such forcible language respecting the effect of change of climate, soil and culture, in changing, not only the quality of the produce, but even the variety that produces it, into another, higher or lower in the scale of perfection, requires some further notice, because it is a point of great practical importance, and one which should be well understood. It is not, therefore, with the little ambition of attempting to controvert an opinion advanced in opposition to one casually expressed by myself, and which is as likely to be wrong as right, but in the hope of holding out inducements to the enterprising to endeavour, by carefully conducted experiments, to improve even our imported varieties, and to direct attention to a mark, by which the uninitiated in the mysteries of selecting cotton, may possibly be enabled to tell when his crops are deteriorating, and when a change of seed has become necessary.

Because the seed of the Uplands are covered with a green down, and the fibre different from that of the Sea Island, which has a smooth seed, it is the opinion of Mr. Fischer that it is next to impossible for the one to pass into the other, under any change of climate, soil and culture that can be applied; while, at the same time, he expresses the opinion that the Bourbon may be deteriorated Sea Island. Following Roxburgh, who supposes that the Bourbon cotton is the West Indian *Gossypium Barbadense*, it follows that both it and the Sea Island are the same species; for the Sea Island was introduced to these islands from the West Indies, hence the change to a more congenial soil has raised an inferior kind in the one case to the first rank, and in the second to the next place, both the Sea Island and Bourbon being superior to the average run of West Indian produce; but in the one, Sea Island, the seeds have become smooth, in the other, they are covered with fur; such at least is the case with all I have seen. Again Mr. Spalding, a careful and observant American cultivator, says, " it may be remarked, however, that short stapled wool is of better quality, when grown near the sea than at a distance * * * that the three long stapled varieties, namely, *sea-islands*, *mains*, and *santees* (local denominations of the three varieties), may each be sub-divided into several other varieties (sub-varieties), which are only distinguish-

able by the seeds and qualities of the cotton; the first sub-variety is covered entirely with *green* fur, and has a beard of that colour at one end, while the seed of the primary varieties is pure black, but is sometimes wholly or partially covered with white fur."* Here then it appears that neither the absence nor presence of fur, nor its colour, afford any distinctive mark, since all the three smooth seeded varieties of long staple cotton have sub-varieties with woolly seed, the colour of which is sometimes green, sometimes white, while the fibre of the green kinds is different, being considered of inferior quality.

A rather remarkable circumstance, bearing on this point, was presented to my notice the other day. A quantity of smooth Egyptian cotton seed was sown at Madras, a portion of the produce was presented to the Agri-Horticultural Society at its last meeting (5th July), more than one half of which was covered with a thick coat of green fur; of the remainder some seeds were partially covered with the green, some with white, fur, and part quite smooth. The stock of seed from which these were reared was received direct from Egypt, and was nearly all smooth and black. While such changes take place, and with such rapidity that they are completed in a single generation, it is impossible to adopt Mr. F.'s opinion as to the non-convertibility of varieties into each other, especially of superior into inferior; the opposite change might not be so easily effected. Nor would it be safe to answer in the negative the following question of Mr. Seabrook, though I confess I cannot adduce any facts which would enable me to answer it in the affirmative. "May not the seed of the Sea Island cotton have been received from the isle of Bourbon, and may not the Bourbon planters have got the seed of their highly prized cotton from Persia, since it is now known that the Persian is no ways inferior to the Sea Island, except in strength?" Roxburgh, as already stated, supposes the Bourbon cotton to be derived from the West Indies; an opinion in which I confess I am inclined to agree, notwithstanding the West received from the East (as stated by Mr. Seabrook) the genuine cinnamon and mango about the middle of the last century; because it seems exceedingly probable that ships might carry it back in exchange, and it is highly improbable that the produce of the one remote island, would spread rapidly over the numerous and widely separated islands of the West Indies; while nothing is more probable than that it should rapidly spread in Bourbon, where it had been ascertained, by a few trials, that both the soil and climate were most favourable for its extended and profitable cultivation.

However, be that as it may, it seems now most certain that the absence or presence of fur on the seeds, so far from being

* I here quote the meaning, not the exact words, of Mr. Spalding.

received as a specific distinction, cannot even be admitted as characteristic of a permanent variety, since it may be produced to a great extent in one generation, and it is possible may be removed in the next. This much I can state from personal observation, that seeds, taken from the same pod, may some be smooth, some partially clothed with fur,and perhaps will,in the next generation, be foundcompletely covered. These facts lead to the suspicion that, in proportion as the staple deteriorates, the fur begins, and that we may thus account for the fur seeded varieties of the Sea Island being less valuable than the smooth ones, and the Egyptian cotton above alluded to, though good, being inferior to the original stock. I do not presume, in the present state of our knowledge, to attach more weight to these views than that of considering them probable conjectures, but yet I think them deserving of attention on the part of the cultivator, because, should future observation and experiment prove them to be well founded, they afford him a sure criterion, by which he may know when it is necessary to change his seed ; as an accession of fur on smooth or very slightly furred varieties will indicate the progress of deterioration; and, *vice versa,* the diminution of fur on the rough seeded ones, may afford the best indication of a congenial soil, climate and mode of culture.

Before leaving this subject I must again remind the reader, that I am not in possession of facts sufficient to establish the doctrine I have broached, and that these inferences must, for the present, be viewed as mere conjectures, the value of which remains to be determined by future experiment and observation; not conducted in one country only, or on a small scale, but in many, and in no part of the world so favourably as on the Sea Islands. How interesting it would prove to see the short staple, woolly seeded, Uplands, converted, in the course of a few generations, into smooth seeded, long stapled, Sea Islands ; and the green seeded sub-varieties restored to their place in the first rank : while we, with careful management, may be able to raise our country cottons to a much higher rank than that they now usually hold in the English market ; the improvment being equally marked by a return to smooth seed.

The concluding question of Mr. Fischer's second letter is direct and unanswerable, and in the Salem district his experience of both kinds entitles his opinion to the greatest deference. But, though backed by experience, the only sure guide, in that particular district, we are not yet authorized to adopt it as a general rule, because it has already been shown that at Ingeram the Bourbon entirely failed, while both the Sea Island and Upland Georgian perfectly succeeded, at least on a small scale. The experience acquired in the Salem, Coimbatore, Mysore, and some of the talooks of the Tinnevelly districts, leave

not a doubt of the success with which Bourbon cotton may be cultivated on the red loamy soils with which they abound ; but it does not follow that it will equally succeed in the sandy, saline, coast soils (though it has been ascertained to do so in those near the coast containing a considerable admixture of clay), the very ones in which American experience gives us reason to expect the American kinds will thrive best. The determination of this point, therefore, is still an important desideratum in Indian cotton agriculture, as there are thousands of acres along the coast that might be most profitably devoted to that kind of culture. We know that, generally speaking, cotton cannot be successfully cultivated on a wet soil ; our information as to the fitness of a very light sandy soil is, on the contrary, very defective. Should experience, however, prove them equally suitable, for the culture of the Bourbon, Sea Island, and Upland Georgian, and the former of these retain in both situations its superiority, there cannot, in all such places, be a question of the propriety of retaining it to the exclusion of the inferior sorts; but it would be premature to come to such a determination at this period of the enquiry : while, at the same time, it is exceedingly desirable that a course of experiment should be entered upon near the coast, for the purpose of determining the fitness of coast soils for this kind of agriculture, which has not hitherto been tried to any considerable extent on them. In America, the advantages of a coast station, for the cultivation of cotton, is strongly insisted upon, and to that circumstance alone much of the superiority of the cotton of the Sea Island district is ascribed. Thus Mr. Spalding declares, " the only essential point is a saline atmosphere, with it, any soil in Georgia or Carolina may produce fine cotton, without it, no soil will."

This is certainly laying down the law in strong terms, more so, I think, than the evidence he adduces in support of it warrants, and I hope much more so than our experience in this country will ever admit, and leaves room to suspect, that he has allowed some pre-conceived notions, respecting an imaginary property of the atmosphere, to mislead his usually correct judgment, and led him to mistake the difference between an atmosphere loaded with saline particles, and a soil impregnated with deliquescent salts, acted on by a simple humid atmosphere, thereby maintaining that moderate degree of moisture requisite for the most perfect development, as an annual, of both the plant and its products.

In India a coast exposure may not be found quite so indispensable to the production of fine cotton. In America the plant is from necessity an annual, being too tender to survive the winter frosts; hence it must pass through the successive stages of its existence in the summer season or during the short period of about seven months.

Our aim, on the contrary, is to counteract this rapid course, and permit the plant to attain a greater degree of maturity before beginning to bear, in the hope by so doing that the quality of the produce may be improved and augmented, at the same time that the duration of the plant is prolonged. The tendency of the plant to shoot its root straight down into the earth to a considerable depth, where, even in the dryest season, it enjoys constant humidity and coolness, enables us to accomplish this object, and at once change its habit from annual to perennial. So far as our attempts to cultivate this valuable variety have yet extended, we have not found any soil in India equally congenial with the American ones, but we certainly ought not to give up the attempt to find similar ones; for, if we succeed, owing to the perennial character of our plant, we may expect, if such is possible, even better cotton than the original, on the strength of our second and third crops of other perennial kinds, being somewhat better than the first. The light saline soils of the coast, it appears to me, are those most likely to approach the American ones, while, from being more easily penetrable by the roots, they hold out the prospect of being better suited to this kind of culture than the more stiff and clayey ones of the interior, while their saline impregnation will no doubt contribute to aid the so called saline atmosphere, held to be so necessary in America, but which, according to their own showing, is not enough.

Thus it is stated that the cotton plant thrives best in an alluvial soil a little impregnated with salt—that the most productive soils in Louisiana are deeply tinged with red, and well impregnated with salt—in Guiana, salt is considered to promote the growth of the cotton plant, and the old lands are frequently flooded with salt-water. These statements of the value of a saline soil, the existence of which is susceptible of demonstration, afford strong grounds for doubting the doctrine of a saline atmosphere, a questionable property, and lead us to infer, that the superiority of our black soils for the production of cotton is partly attributable to the saline matter with which they are so generally impregnated.

Regarding the experiments, mentioned in the first part of this paper, as in progress in my garden, I may take this opportunity of adding, that, owing to the intervention of some errors, but too apt to occur in first experiments to mar success, they have not hitherto gone on so prosperously as I could have wished. They may, however, be adduced, as affording a striking exemplification of the tenacity of life of the cotton plant, for, though transplanted, in very dry weather, into ground inadequately prepared, scarcely a plant was lost. In the instance of the short stapled American plants, I have failed in accomplishing one of my objects, that of preventing the early flowering, for they are now, though but few of them exceed nine

inches in height, covered with flowers and full grown pods, some of which have already burst. Some time was certainly gained by the expedient of transplanting, as several of the plants had begun to flower before that operation was commenced, and hurried it, though the weather was most unfavourable. The plants have now a shrubby, dwarfish appearance, but the pods are very large, and the cotton of the few that have opened is of fine quality. Should the rains soon set in, so as to admit of the ground being thoroughly dug and lightly manured, while the plants themselves are pruned, I have no fear of yet obtaining a very favourable result. The Bourbon cotton plants, the ground for which was better prepared, promise much more favourably; they are now growing freely, look healthy, and are only beginning to flower. The Sea Island plants look delicate, but will probably recover their vigour on the accession of rainy weather. A few, which were more carefully managed, and planted in better soil than the rest, are very strong and vigorous, and promise a large crop. Several of these have been topped and are throwing out numerous strong lateral branches, giving reason to anticipate a vastly increased produce, not less, I think, than four or five times the quantity that otherwise would have been produced.

The soil on which these are planted proved on being dug a very stiff clay, in place of a light loam which I at first supposed; and part of the failure is I think fairly assignable to its not being sufficiently wrought before being planted. Another portion of ground, the soil of which is a light sandy loam, remains to be planted, and will still afford a good means of comparison, though not so favourable as if it had been planted at the same time.

The following extracts, occasionally considerably abridged from Dr. Ure's work on the cotton manufacture of Great Britain, exhibiting some of the more important points of American cotton agriculture, may prove of use to those so engaged, in a country where that book is as yet but little known.

"The only essential point seems to be a saline atmosphere; with it any soil in Georgia or Carolina may produce fine cotton, without it, no soil will do so." This doctrine seems very questionable, as already explained.

"The preferable time for sowing Sea Island cotton seed is from the 1st to the 15th April." "Any vegetable manure is good for cotton, but it must be applied judiciously, for excessive luxurance renders the fruit scanty." This is on the Sea Islands themselves, and with the view of raising an annual plant, which must have finished its crop before the frosts of November and December have commenced. With us about the same season may equally be found the best for sowing, though not for the same reason. Mr. Fischer's experience leads to this conclusion.

"In August very boisterous and rainy weather usually occurs, and loosens the soil so much, that, if the plants are not well earthed up, they are apt to be blown down and destroyed. It is in this month also that caterpillars and blight make their appearance, sometimes to such an extent as to destroy hundreds of acres of plant in the course of two or three days."

"The fields should be entirely shaded from the sun when the plants are fully grown, the distance between their roots should be adapted to this circumstance ; while thinning and hoeing to remove weeds, the earth should be well gathered round the roots." "The number of workings (hoeing and earthing up the roots) seldom exceed six ; the last about six weeks before the crop begins. In general, the plants, which grow about three feet high, are left about ten inches apart—four feet, one foot—six feet, two feet and half apart—one hundred and thirty pounds of cleaned or ginned cotton per acre is considered a good crop." "In the Sea Island district four acres produce about five cwt. of ginned cotton—four of which are white, and worth about 10*d.* per pound; the other stained, and only worth 5*d.* per pound."

According to the above rules the fields appear to be more crowded than is consistent with deriving the greatest produce from the land, and the bushes are not cropped, which, by making them spread, in place of rising to so great a height, would tend to protect them from the dangerous storms of August. Nothing could be more easy than to top with the finger and thumb the leading shoot of each plant, in the course of their various workings, and at once thin out to two or two and a half feet; labour would be saved, the ground less exhausted by having only half the number of roots to nourish, and be sooner and better shaded from the sun; while, from the greatly augmented flower bearing surface thus produced, the quantity of flowers and fruit would be proportionately increased, perhaps to the extent of not less than 20 or 25 per cent.

In gathering and packing the cotton for transmission to market, much care is bestowed.

"In gathering care must be taken to remove the locks of cotton without breaking off any of the dry leaves, and if any fall on the cotton before the picker has secured his handful in the bag, they must be carefully separated. In preparing cotton for the market, the seed-cotton is first whipped—that is, put into a long conical sloping cage of open wire or basket work, closed at one end, traversed by a shaft furnished with a number of cross bars. The cage is fed by a hopper, while the shaft is rapidly turned by a crank, or handle, by which the cotton is whisked round the cage, till it drops out at the lower open end, completely freed from any sand or other impurities, which drop

out between the bars of the cage—then picked or motted by women—then ginned, lastly, picked again to remove stained portions, broken seeds, &c., and is then finally packed for the market." "The leaves and pods of long staple cotton are smaller than those of the short; the pod of the former opens into three, that of the latter into five." This s far from constant, as the pods of all my short staple cottons have but four segments.

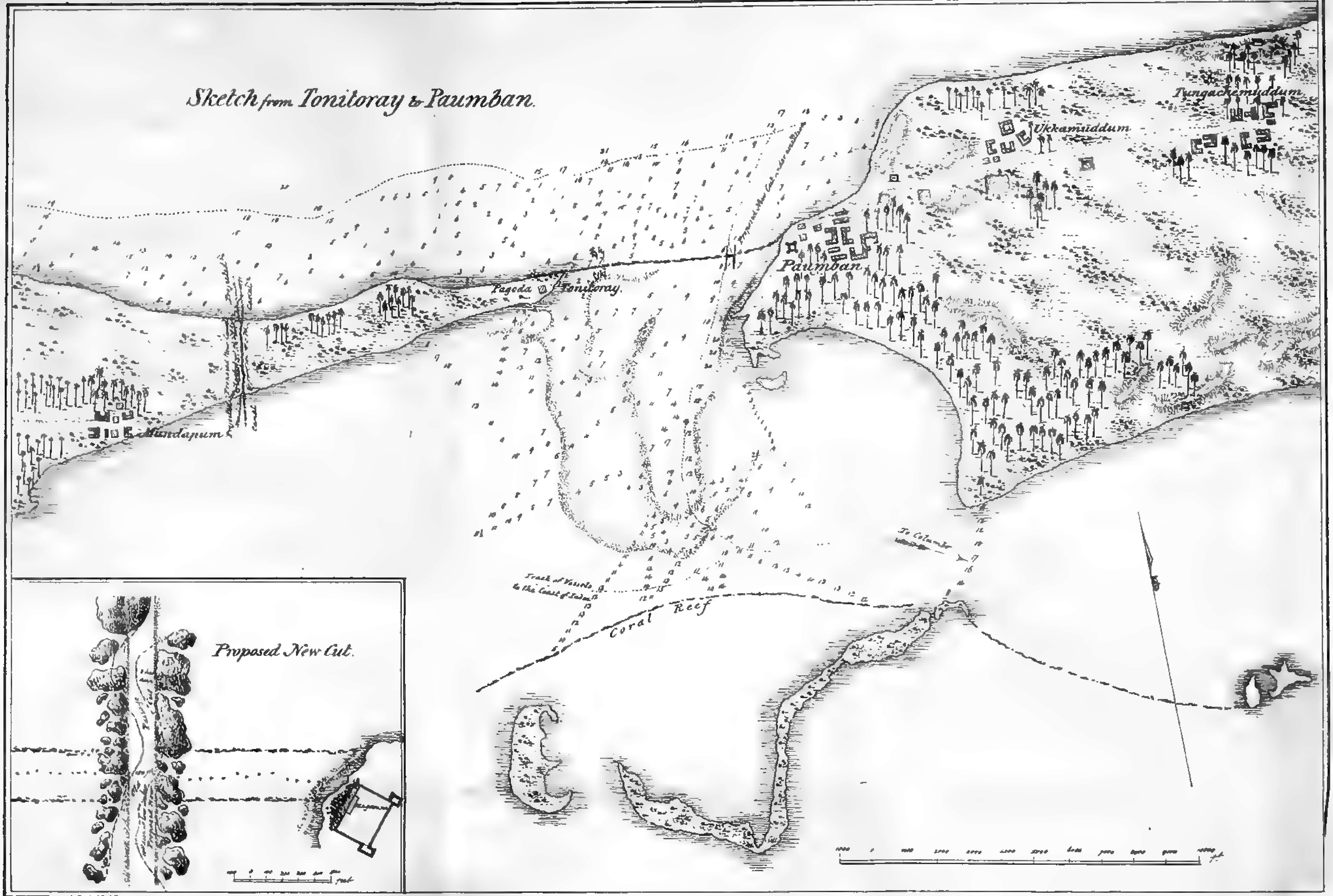
"The cultivation of short stapled cotton is less expensive and less precarious; the winds are not so high in the interior, the valves of the pods do not open so much in ripening, and less is lost by the cotton falling out spontaneously. The short staple pods are allowed to hang on the plants till they are white with wool, so that they may be reaped at one or two gatherings, instead of ten or twelve employed in the Sea Islands, and therefore half the cost of labour."

"It may be remarked, however, that short stapled wool is of better quality, when grown near the sea, than at a distance, and it thrives most luxuriantly in alluvial soils a little impregnated with salt. In Louisiana, between the Arakansa and Red river, the soils are deeply tinged with red, and well seasoned with salt, and give the most abundant crops of the best quality cotton. There the English acre produces about 1000 lbs. seed-cotton, or 250 ginned, while in the hill country, from the Mississippi to the Carolinas, not more than 500 lbs. of seed-cotton can be obtained."

"The average produce for both long and short-staples is about 500 lbs. of seed-cotton, or 125 ginned, per acre. Some fields produce double that quantity, but they are exceptions which can never serve as guides to just conclusions, respecting either the wealth or productiveness of the country—the besetting sin of agricultural statements is their exaggerations."

This statement falls more within the bounds of probability than the very exaggerated one of Captain Basil Hall, who informs us that from 12 to 1600 lbs. is the average produce per acre of ground throughout the United States.

In the Indian peninsula, the average produce, in eleven districts, the two principal cotton ones not included, is, for all kinds of cotton, 430 lbs. of seed-cotton per acre. This result is not a great falling off from Mr. Spalding's estimate, when we consider the greater degree of care bestowed on the culture, and the more productive kinds in cultivation; and holds out a strong inducement to us to persevere in the attempts we are making to cope with the Americans, in working this rich mine; the more so, now that that favoured country has supplied us with her own weapons with which to engage in the honourable rivalry, of contending who shall most contribute to the comforts and


Sketch from Tonitoray to Paumban.
Tungachemuddum
Ukkamuddum
Paumban
Pagoda
Tonitoray
Mundapum
To Columbo
Coral Reef
Proposed New Cut.

conveniences of the rest of mankind, by supplying the means of providing cheap cotton fabrics of every kind and description.

I shall conclude these supplementary observations by extracting from the Transactions of the Agri-Horticultural Society of India, vol. 3, page 132—the following brief account of the mode of cultivating cotton in Egypt, drawn up by Mr. Waghorn.

" Maho cotton is sown in trenches about five feet apart, and four or five seeds in every eighteen inches. If they all spring up, they take out all but one, which they conceive the most healthy.

" It must be sown in a fat soil, a sandy soil will not do. The cotton grounds are situated near the banks of the Nile, or some canal near it, where there is water the whole year. It must be watered every three or four days when it first begins to sprout, and afterwards every ten days. The crop is gathered from June to January, two crops each year from each plant; the plants should be renewed every three years."

X.—*Account of the Operations for widening the Channel of the Pamban Passage in the Gulf of Manar.—By Colonel* W. Monteith, K. L. S. *Chief Engineer.*

It has long been earnestly desired by the Government of Madras, as well as by the public at large, that the obstructions to the navigation, which extend across the gulf of Manar, should be removed, or, at any rate, a clear passage opened for the coasting vessels both of Ceylon and India, to enable them to convey the produce of Malabar, Travancore, and some other most fertile districts to Madras, the great point of export, without the delay, risk and expense to which they are at present exposed.

In consequence of the representations made to the Court of Directors by the Right Hon. S. R. Lushington, then governor of Madras, a survey of the generally used passage between the island of Ramisseram and the peninsula of Ramnad was made by the joint efforts of the officers of the Royal Engineers from Ceylon, and Major Sim with a party from Madras. During the year 1828, some experiments were made as to the practicability of improving this channel, and some of the most prominent rocks were removed. The passage was also rendered more direct and easy of access.

The work was, however, discontinued, and orders were received not to renew the attempt, strong doubts having been expressed of ultimate success. The officers' reports were published in 1833, and public at-

tention was again directed to the subject, the experiments ordered to be renewed, and 5,000 rupees granted for this object; with the further assistance of stores from the arsenal, a party of Sappers and Miners, and 50 convicts : and I was directed to superintend the work, which is now in active progress, and promises to be successful, as far as the sum allowed can be expected to go; and it is now almost certain that a 12 feet channel can, and will, be obtained at this point, the gulf of Manar having only this depth for a considerable distance.

The following Journal details the operations when I was at Pamban:

Journal.—Feb. 1st 1837.—Embarked on board the native brig *Agamud Buksh*, with 3 serjeants, 1 havildar, 1 private of the sappers, and the stores destined for the experiments at Pamban.

2d.—Anchored at Pondicherry, as there were a great number of passengers for that place, with some cargo, which was engaged to be landed by the evening. Leaving the party on board in charge of the stores, I landed for the purpose of examining the light-house, which I obtained permission to do and take any observation required. It is a plain, but neat, structure, 90 French feet above the level of the sea; the lights fixed, and of good description. It is altogether well adapted for the purpose, but requires a little more ventilation, as the light appears to become dim after some hours burning.

3d.—Embarked at 7 A. M., and soon after weighed anchor.

4th.—At day light off Negapatam, and in the evening took our departure from point Colymere. I directed the serjeant of the watch to see the lead cast every half hour. The first sounding was 5 fathoms, which soon increased to 6, at which it continued for about 15 miles; then to 7, which held till one in the morning, at which time I made the tindal anchor. As we could not be far from land, if the current was as strong as is generally supposed, we came to in 7 fathoms; bottom a strong blue clay, unmixed with either sand or coral. On trial found no current whatever, and the next morning a piece of timber, thrown over during the night, was still near the vessel. Ascertained the latitude by the meridian altitude of a star, and found we were 17 miles from land.

5th.—Weighed at day light, and at 10 A. M. were 3 miles from Pamban. The soundings now rapidly decreased to 5, 4, and 3 fathoms; I called on the tindal to anchor, which he did ; in swinging round the vessel struck violently, and I found we had only $1\frac{1}{4}$ fathoms at the stern. The vessel was hauled off in an hour, the weather fortunately being very moderate, and by 2 P. M. the stores were all in boats.

6th.—I inspected the detachment, which, with the party I brought, amounted to 1 second Lieut. C. M. Elliott, 5 serjeants, 1 jemadar, 6 non-commissioned officers, 82 sappers, 50 convicts, with some peons belonging to the collector of Madura.

The greater part of these men had been here since the 18th of January, and had been fully employed in the erection of work-shop, store-houses, barracks, an hospital, and huts. The buildings were well adapted for the purpose ; the men were allowed to lodge themselves, which was preferable to the plan proposed of providing a barrack, which I had intended, thinking, as this was only a temporary duty, the men might not bring their families.

The building originally intended for the sepoys will become, when finished, available for the lodgment of the convicts. It is advancing very slowly; as we are obliged to bring clay from a distance of two miles, a sufficient party cannot be spared for the purpose. It is not of much importance, the convicts being lodged in a choultry, which is more secure.

Ordered part of a stone-roofed passage in the old fort to be repaired, as a magazine for the gun-powder. Only one sick in the detachment of 90 men.

7th. Examined the country for three miles round to ascertain what materials were procurable : found abundance of dwarf jungle, but the trees, almost entirely *Mimosa*, with branches shooting out at right angles to the stem, which is generally twisted, very difficult to work, and too heavy to form rafts. Lime and free stones plentiful, and near the sea-shore a few palmyras and tamarind trees, with abundance of coco-anut, the only other timber on the island.* Purchased some mango and teak planks from a merchant, and selected eight canoes, to form rafts for the work in the great channel.

8th. Inspected the small channel, and ordered a party to remove some large stones, and another to bore the rock at its northern extremity, which nearly blocks up the passage. Proceeded to the great channel, and ordered it to be correctly marked off by small floats with flags, at intervals of about 30 yards. Before leaving off work, fired two small charges of powder in the two holes that had been finished ; one split the rock into small pieces, the other found vent through the bottom, and did little execution.

9th. The buoys were this morning laid down on one side, and anchored with large stones. Purchased two catamarans from a vessel to complete the floats ; no light wood being procurable in the neighbourhood. The working party succeeded this day in boring 10 holes in the rocks at the head of the small channel, which were immediately loaded and fired. Charge 8 and 10 oz. of powder, contained in bottles 9 succeeded perfectly, and shattered the rock into small fragments which were easily removed by the hand. The remainder of the men employed in deepening the lower part of the channel. This is the most

* Except *Ethee* planted near pagodas, and along the great roads to Ramisseram.

profitable use to which the labour of the party can be applied, during the time we are waiting for the supplies from Ceylon, and completing our preparations. It is of little less importance than the great channel; all the boats with the cargoes of the vessel pass through it, which they can do in all weathers.

11th. Men employed as yesterday; fired 8 more blasts, a few with increased charges, and the holes at greater intervals; the splinters were thrown to a considerable distance. Large charges can only be employed when the rock is entirely under water. This day some carpenters and smiths offered, and were hired on trial; they had come from Ramisseram and the neighbouring villages. The whether is now variable, with a southerly wind for a few hours in the day, which denotes the calm season. Hastened the work as much as possible, and heard from a vessel which left Colombo three days since, that the Ceylon party were near.

12th. Sunday.

13th. The artificers employed on the rafts and boats. The sappers and convicts in removing the rocks broken by the mines, and in deepening the channel.

14th. Twenty-one sappers employed as yesterday in removing the stones, and the convicts in deepening the channel. Artificers on the boats. The new jail advances slowly, as we can only spare 10 men to work on it.

15th. Party generally employed as yesterday, and 12 more holes bored in the main dam of the small channel. Our success was not equal to the former trials, the match for exploding under water being of an inferior quality. This is the first we had tried of that manufactured at Madras, in imitation of the English; some part was made by the Engineer sergeant-major, the rest at the depôt St. Thomas's Mount: eleven out of the twelve failed. The convicts, who had shewn signs of insubordination for some days, positively refused to work in the water. I was obliged to order 12 sappers under arms and secure 6 of the ringleaders, who were slightly punished by the Chouckdar, and the remainder forced to work. The extent of punishment which can be awarded appears to be little understood, and is the cause of the small value of this labour under the Madras establishment.

16th. This day 2 sergeants and 13 men sick, principally trifling accidents and bowel complaints from constant work in the water. The men as yesterday, and 4 trying to extract the charges which had not exploded, but without success. The vessel expected arrived from Ceylon bringing some stores, 8 seamen and a diving-bell.

17th. The raft for working in the great channel was this day finished and launched; it rode well and promises fully to answer the purpose. Eight more charges, fired with the English match, answered perfectly; the others as yesterday failed.

18th. Almost the whole of the men assisting in unloading the stores, and bringing brush wood to lodge the diving-bell on. The shears, constructed with four coco-anut trees, were not strong enough to support the weight; procured some large palmyrah trees, six of which were employed in making another pair of shears—16 holes fired to day, 15 with excellent effect, the match Europe. The main dam is now passable at all times of tide for boats.

19th. Sunday.

20th. Sent a large cargo boat to receive the windlass of the diving-bell, but it went to pieces with the weight. There are no craft here capable of receiving this machine, nor people to work it; being 5 tons in weight, the diving-bell may be said to be unmanageable, and has, I believe, never been used in Ceylon.

21st. Diving-bell raised out of the Ceylon boat and suspended till a bed of fascines, stones and trees could be prepared to receive it. Went to Ramisseram to ascertain what resources it could furnish, in boats or materials, but found little or nothing; the town depends almost entirely on the pagoda, and the pilgrims who visit from India.

22d. Men almost entirely employed with the diving-bell; the stage finished except the palmyra trees.

23d. The bell lowered, and by a mistake of the native officer brought on shore. It is now useless trying to remove it, so it has been allowed to remain till required, or fit boats provided for its reception. It will not be required till near the close of the operations. Ceylon government vessel, the *Wolf*, sailed for the pearl banks.

24th. A new shed was commenced this morning for the blacksmiths; the one they formerly worked in being required for the stores received from Ceylon. The sappers principally employed in enlarging the mouth of the small channel; suspended the work at the jail, not being able to procure clay, and a sufficient party could not be spared to bring it without detriment to more important works.

25th. The rock at the mouth of the little channel had been bored in eight places, and at 11 A. M. the blasting commenced with very good effect; two charges with the Madras match failed, the others succeeded perfectly, and entirely broke the rock, giving an opening of 24 feet to the channel. The charges were this day contained in leather bags of undressed sheep skins, covered with dammer, and are preferable to either the tin, cases or bottles; the expense is also much less than the tin and not so subject to injury in tamping.

26th. Sunday.

27th. This is the first day the sea was sufficiently calm to admit of work being carried on in the great channel, where the raft was anchored, and answered perfectly. Four holes bored in the rock, but not finished before the tide had risen, and the current became too strong

to load. Put poles into the holes to mark their position, and returned. The party at the small channel had removed some large fragments of rock with greater ease than before, by means of the windlass received from Ceylon; this also obviates the necessity of the men being any length of time in the water. New work-shop finished, and the second raft nearly completed.

28th. The raft again proceeded to the great channel, and succeeded in boring six more holes in the rock. At 12 o'clock commenced loading but the tide rose so rapidly, and the sea becoming rough, were obliged to postpone the firing till to-morrow. Party on shore erecting a hut for the seamen, and twenty-two men in the small channel, who removed in the course of the day about twenty tons of stones; ten more holes prepared for blasting. The health of the men has appeared to improve; there are at present only six in hospital, a decrease of seven since the middle of the month; they have been less in the water than before.

March 1st. The great raft proceeded to the main channel at seven A. M. and by 11 had seven holes ready for loading; they were instantly charged and fired, six with very good effect; the charges were contained in leather bags, and Bickford's hose burnt with its usual certainty. One failed, from the fuse being cut by a stone, but the powder was taken up on the following day perfectly dry. Another raft was nearly finished; half the party still employed on the small channel, and the convicts in bringing coco-anut trees from some distance.

2d. The breeze was strong from the N. E. and the sea high in the main stream; the decked canoes rode perfectly well, but the progress was slow, as the divers could not work at the bottom owing to the strength of the current; only five holes were bored and three were loaded and fired. The weighing boat brought up some tons of stone, but could not work after 11 A. M, from the force of the current and wind. Fourteen men were permanently attached to the weighing boat; some large stones were brought up with apparent ease, and lashed on the sides, after which they were cut away at about 100 yards from the channel.

Though our progress in the principal object of deepening the main channel has as yet been trifling, in fact is just commenced, the results are such, as to leave no doubt regarding the ultimate success of the work, and, in the mean time, the small channel has been rendered much more practicable than formerly, and, when completed, will be of little less importance than the main one. It is not included in the present project, but forms a necessary part of the undertaking, vessels being subject to more delay, waiting to re-ship their cargoes, than in passing the reef.

Our preparations as regards boats are now nearly complete, to the full extent we will be able to man. We have three rafts and two weighing boats, and expect a small dhoney with two double catamarans from Jaffna, which will require two reliefs, of twenty-four men each, which is about the number available for duty. According to the rate at which we are now progressing, it will take about three or four months (100 or 120 working days), to deepen the channel three or four feet, according to the thickness of the upper strata of rock, which it is proposed entirely to remove, and give a general breadth of forty yards, besides removing a difficult bend in the centre of the channel.

The rock is very easy to work, and on an average one pound of powder breaks two tons, which we have no difficulty in weighing and removing to a distance on the reef. The divers fix the strings to the stones, which are hoisted up and lashed to the sides of the boats, the smaller only being taken on board. The vessel is then hauled off to a distance, and the stones cut away; the largest stone we have yet had occasion to remove has been about 3600-lbs., and took ten minutes to hoist and secure.

I have restricted the present plan to a breadth of forty yards, being nearly what it has at present.

Before more is undertaken, it will be necessary to ascertain what can be done to give a greater depth of water over the horse-shoe bank, which extends from this island to the main land, through which there is said to be only two channels, having ten feet water at the highest tides. The difficulty of passing this is little considered by the native commanders, as the risk is inconsiderable, and the inconvenience only extends to the delay of partly unloading the vessel. There are few crafts drawing more than ten feet frequent this passage, as the inner channel is said to have but twelve feet. I cannot satisfactorily account for the formation of the bar. The quantity of sand carried through is very trifling, and I imagine could not extend so far into the gulf of Manar, when the strength of the currents evidently sets on the east and west shores, where the present passages are found. It is just possible that this may be the ruins of the dam, when carried away by some great storm, a fact still recorded. In this case, not being subject to fluctuation, or any increase from a constant moving body, if once cut through by dredgers, or other means, it would always remain open, the current increasing with the depth of the water, and the bank being composed of coarse sand with fragments of coral and large gravel, totally differing from the small sand on the coasts, would not be subject to fill up. This is rendered probable by our experience in the small channel, no sand having lodged in the part lately excavated.

3d. Wind very strong with a high sea; no holes could be bored

from the violent motion of the rafts; the party returned and were sent to the small channel. The weighing boat took up about six tons of stone, but was also obliged to return about noon and joined the party in the small channel. The second raft was launched this morning.

4th. The boats were at their stations in the main channel by 7 A. M. and at 11 A. M. eight holes had been made in the rock, some of which were charged with 8-lbs. of powder. The stock of the English hose being expended, tried that made at Madras, which entirely failed, and we were obliged to have recourse to the tin tubes and portfires. The attempt to fire all at the same moment failed, and only one charge took effect, the tubes of the others being damaged by the concussion; the attempt was therefore given over, and the party returned at 1 P. M. a number of holes being ready in the small channel, directed them to be fired with the match newly received from Madras. It all failed, in a strong current; reprimed with portfires, and exploded the charges in succession. One piece of portfire exploded on being fired and overturned the boat containing six men; fortunately was a small charge, had it happened with a large one, the whole must have been destroyed. A number of large stones removed out of the small channel, which is now used by all light vessels, affording them the means of being dragged against the current.

6th. Loaded twelve holes this day, and again tried the fuse made at Trichinopoly, which failed as before, with one exception, which exploded after 22 minutes; as it was considered to have been extinguished, a diver was sent to recover the case, who returned saying it was still burning. The boat had nearly reached the shore when the explosion took place; no accident occurred. A third raft nearly finished.

7th. Recovered the cases which had been lodged in the mines the day before; powder generally dry. Re-charged 7 others; two of these failed; a small quantity of powder, above what the box could contain, having been allowed to remain in the tubes, they burst before inflaming the charge, and water got in. This is a singular fact which experience could only prove. The effect was good and we may now be considered as fairly at work.

8th. Having received samples of the powder hose from several quarters, made a number of experiments both in and out of water, but found no reliance could be placed on it in either case. With the English, made by Mr. Bickford, in sixty-five trials, not one failure took place that could be fairly attributed to the hose.

9th. Four new holes were ready by 11 A. M., but the current did not allow their being fired till half past twelve, when nine were charged and seven succeeded perfectly, detaching a great quantity of stone. Ordered in future the tin tubes to be dammered, as there were some small defects in the solder which admitted water. To this date the work performed by the convicts was below what ought to have been done.

Directed they should in future be divided into small parties, and the work performed measured previous to dimissal.

10th. The raft proceeded to the main channel, and had made eight holes at seven feet distance, there being already ten; but some had been covered by the explosion of yesterday. Eleven were loaded, but some of the skins and tubes were again found imperfect. Six only took effect, but the powder in the others was preserved. Those made by sergeants Reardon and White were very good, and reflect great credit on their attention and diligence; a rock of ten tons, which had obstructed the channel, was entirely removed.

11th. Continued the work as yesterday. Eight new holes made, and twelve remained of the former work. Eight were exploded with only one failure occasioned by the match going out. Directed the charges to be diminished on all prominent rocks affording good lines of least resistance, as we found the stone broken into small pieces; fragments of from one to two tons are best for the weighing boats.

13th. Two rafts for boring were now ready and commenced in the morning. This day fired 70-lbs. of powder, in thirteen charges, all of which succeeded admirably.

14th. All the most prominent rocks having been cleared out of the centre of the main channel, directed a cut should be commenced from south to north of twenty feet in breadth and three feet deep. This plan has been adopted to prevent the lodgment of sand in detached holes, which is difficult after to distinguish from the rock; when a certain length is obtained, the current is expected to prevent any lodgment. This day seven hundred and nineteen feet of rock were removed; the work altogether satisfactory.

15th. Fired fifteen charges or 74-lbs. of powder; the effect was greater than we had ever before experienced, several blocks of stone of two and three tons each were torn from the bed and projected several yards from the mines.

16th. This being the Buckreed festival, the Mahomedans had leave, and no divers would work; two parties of convicts this day worked exceedingly well, and did as much as any other men. Six charges only were fired for want of the divers, and all with good effect.

Since my last report our progress has been regular and satisfactory; the men are now accustomed to the work, and perform more than double what they were able to do at first. We formerly raised about 300 cubic feet of stone per day; the return for the last five has shewn 700, and, when the catamarans arrive, will probably be 1000. The maximum I think this party capable of performing.

The experience now gained is sufficient to form a correct estimate of both the expence and time necessary to complete the undertaking, and

is not subject to any considerable error, the work being simple, the operations certain, and results known.

The reef, or bed, to be cut through, extends about four hundred yards, from N. to S., double what has been previously stated. The mistake has taken place, from the centre having only five feet at low water, and the flat bed of the rock, both above and below, from six to six and half; vessels being obliged to reduce their depth to five feet water felt no inconvenience from the previous obstacle, but the case will be totally different when the centre reef is removed to ten feet. This is now in progress, and has been gained on in an extent of about eighty yards in length, by twenty feet in breadth, and will be completed to those dimensions, through the whole extent, in one month from the time we have been fully at work.

I have adopted the plan of cutting a narrow channel, through the whole extent in the first instance, rather than working on the breadth, as I found the current swept this long narrow cut, and prevented the lodgment of any substance which might be brought in by the current, whereas the other method only produced a pool for its lodgment. It will also enable the Government to proceed to the extent they may think proper, a positive advantage having been obtained, be the channel broad or narrow. A certain breadth is necessary for the convenient passage even of small vessels, and this season I do not think it can be extended to more than fifty or sixty feet—there being at present about seventy days remaining, if it be certain that work cannot be carried on after May (a fact I do not think yet established). The Government will, I trust, permit the detachment to remain at such a distance as to allow their returning to the work in August, when the season is known to be favourable for two months. It will be a great subject of regret if the object is not now obtained, or if it should be imperfectly executed, when the success is positive and the expence inconsiderable, in comparison with the advantages to be gained. A small party can be left with a non-commissioned officer to take charge of the boats, stores, &c.—they may be the seamen.

17th. This day fired twenty-three charges, in 102-lbs. of powder, with very good effect. The boats carried off 800 feet of stone. The work of the convicts under the boatswain equal to any others.

18th. This being the last day of the Buckreed festival, no work could be done. The few Roman catholic divers we got to replace the others, were not equal to the work ; eight holes made by the two rafts, and 509 feet of stone removed.

20th. Fired 63-lbs. of powder, in fifteen charges ; two failed from the pipes having been cut, and were the remains of what had been fired before ; it being necessary to spare as much as possible the tubes, all the

country match having failed. The divers and boatmen had not entirely recovered from the effects of the festival. Removed 652 feet of stone.

21st. Only half a day's work was done, as the weighing boat and tackle required repair; fifteen charges fired, and 597 feet of stone removed.

22d. The current was to-day exceedingly strong, and the divers gave up early; six charges were fired, and 350 cubic feet of stone removed.

At day-light proceeded to examine the passage through the sand bank. Its figure, as well as the soundings, do not appear to have varied in the slightest degree since the survey made under Major Sim. The channel is precisely where it then existed, with a depth of five and a half feet at the lowest tides, and about eight high water. It gradually increases to twenty feet, which is found near the shore close to the island of Ramisseram, and the greatest depth close to the edge of the bank on its eastern side; the remainder of this space has seldom more than ten and twelve feet water; bottom, rocks mixed with coarse sand, broken coral, &c. All vessels are obliged to pass over this part. Those proceeding to Ceylon have an open passage, with eighteen feet water; the channel to the coast of India is round the southern extremity of the bank, and has only twelve feet at low tides. Vessels can, however, gain the open sea by the Ceylon passage, which is seldom done except when commanded by Europeans. This route is well sheltered by a chain of coral reefs and islands, which protect it from the S. W. winds. I followed the whole extent of the bank, and found in no place but the one above mentioned more than three and three and a half feet. Near the eastern side, close to Tonitora, the bank is only a few yards in extent. It is said an opening was forced by the storm of 1814 through this point, of equal depth to the other, which gradually closed up, and it is now such as I saw it in the year 1809.

Having thus ascertained that no other passage existed, I returned to the point before mentioned, and commenced a minute examination of its composition. Contrary to the opinion I had previously formed, the centre and most shallow part was composed of fine sand, mixed with blue mud, and covered with marine plants, abounding with insects and sea worms, which would appear to indicate that it never suffers any material change, and is not, according to the reports of the masters of the dhonies, covered with sand to nearly a foot in depth during the S. W. monsoon. I remained on this point till the tide had commenced to flow from the north, running at the rate of nearly five miles an hour over the reef; here the rapidity was trifling, never exceeding one and a half miles per hour, the velocity being lost in the great expanse of water over which it spreads on passing the reef.

This renders it doubtful if the force of the current alone, even with the aid of an embankment, would be sufficient to increase the depth, bound as the soil is by the roots of weeds. An embankment, however, if extended to the shore, would throw a much greater body of water on this point, and if a passage was at the same time opened by dredging, the current would I think be sufficient to prevent its again filling up. The expence of this, beyond the purchase of a dredging machine, and the vessel to work it, would not be great, to save expence the embankment should be made of piles, cut near the spot, and filled up with loaded fascines, also procurable from the thorn trees which cover the whole island, many of which are sufficiently long and straight to answer this purpose of piles; the wood is hard, heavy, and lasts better than teak under water. The crooked timbers of large cargo boats are generally of this wood.

This strikes me as the only plan likely to give a moderately deep passage, without a very heavy expence, and is not liable to any uncertainty but what must exist in the execution of all works exposed to the action of the sea. The extent to be thus excavated is only four hundred yards, and the embankment double; but much of the latter is in very shallow water, where long piles would not be required.

Another plan, suggested by Major Sim, of cutting a canal through the eastern part of the reef, I found liable to much greater uncertainty, though it had a flattering appearance at first view; it would require greater labour than the main channel, and, when completed, be of difficult access.

The improvement of this passage I therefore consider as confined to a depth of twelve feet, high tide, which is, however, a very important object, and can be attained at a moderate cost.

I now proceeded to examine the site fixed on as presenting the greatest facility for the excavation of a canal, and, after following the line of coast for a considerable distance, returned to the spot where the sea forced a passage in 1814, and which is in every respect the best adapted for the purpose. Commencing from the southern side of the cut, I found the sea clear of rocks, and deepening rapidly to eighteen feet, which is obtained at four hundred yards from the shore, and continues till it joins the inner passage to the coast of Madura. This point forms an extensive basin, well sheltered from all winds, where vessels could anchor with safety, and immediately in front of the passage, leading into the open sea, with a depth of eighteen and twenty feet, which increases after passing the chain of islands and reefs to five and eight fathoms; bottom, coral rocks, with a few spots affording anchorage on beds of mud and sand.

The party I left on shore had succeeded in clearing away the thorn bushes, so as to afford an open view of the nullah, which is nearly on a

level with low water, and on some places salt water still stands in pools. The distance across is only two thousand one hundred and thirty feet, and the soil perfectly easy to work. A canal would therefore be readily excavated, offering only the difficulty of pumping out the water to gain a depth of eighteen feet below the level of the sea, and would be a work of less difficulty than cleaning the ditch of Fort St. George, or even the canal across the esplanade. The beds of sandstone would rather assist than retard the excavation, and furnish an excellent material to line the banks of the canal; a precaution absolutely necessary to prevent its filling up with the sand of which the soil consists. Thus much of the work would therefore be performed with certainty; the expence would be considerable, but still much less than works of this scale and importance generally cost. The most formidable part of the undertaking still remains, viz. continuing the canal into deep water on the northern side, where the rock shelves gradually into twenty feet, at a distance of one thousand two hundred yards, covered with coral in every form, and approaching in some places to within a few feet of the surface. This is, however, a simple question of expence, and not of difficulty; the execution is perfectly easy and certain, with time and means. But I fear that nothing less than piers on each side would effectually protect the canal, or enable vessels to pass along it at all times, and lock gates must be formed at each extremity of the land cut, to prevent a current, and consequently any deposit or passage of sand. Should a small quantity by any means lodge at the mouth of the outer canal, the water retained by the gates, and discharged by means of under sluices, would effectually remove such an obstruction. The appearance of the rock, as also of the coral, would indicate that no such deposit takes place; and, if no current is allowed through the passage, it appears probable, and even certain, that the cause of an accumulation of sand would be prevented.

The only point to be decided is, if, with a channel of twelve feet, which may be obtained at this place, there will remain any object in having another of eighteen. This is a question I am not competent to decide; as it must depend on the importance attached to the commerce of the country, as also regarding the passage of steam vessels or ships of war by the shortest and most practicable route at all seasons.

23d. Both weighing boats in full work, and by 2 P. M. had removed 1130 cubic feet of stone, about 75 tons. The explosions had not so great an effect as usual, having come on a flat bed of rock, extending across the whole channel, affording no weak points from which a line of least resistance could be found; the tamping was generally blown out. Directed the holes should be made five feet deep, quite through the

rock, and charged with 12-lbs. of powder each, at intervals of four and five feet.

24th. The holes were not sunk to the required depth, as the divers could not reach the bottom with their hands, and the sand or powdered stone was washed out of the ladles before reaching the top. Directed an auger to be made with a tin tube for this purpose. The work was, however, very good, and 1414 cubic feet of stone removed. The boatswain with the convicts did more work than the sappers, which must be attributed to the excellent superintendence they were under.

25th. The holes were now sunk to the required depth, and one 10-lb. charge fired, which made a crater of about four feet in diameter. The other holes were charged with less, as the rock was found not to be of great thickness; three craters were produced, but the rock was not as usual rent beyond the actual effect of the charges. We regretted much not having it in our power to have simultaneous discharges, which would make a large excavation at once. The present method will be tedious and fatiguing, from the length of time it takes to charge and return to the same spot. The rock is so exceedingly soft it offers little more resistance than clay, so on a perfectly flat body the effect was comparatively trifling; a considerable portion of rock had been detached, and 1524 feet was removed, through the energy of the person before mentioned, boatswain Morris; 103-lbs. of powder expended, in seventeen charges, without a single failure. The leather cases well dammered and dusted with lime, answer better than tin cases, and are of much less cost.

27th. Received a letter from the assistant government agent at Jaffna, and also the boat and machinery for weighing stones. The frame and wheel of this machine are calculated for a boat of double this size, and as much above the centre. It will not answer for stones of any weight, which is much to be regretted, as the machinery is of the best description, and the boat a beautiful model. Removed today 1143 feet of stone, part of the hands being employed on the Jaffna boat.

28th.—The wind has changed decidedly to the south, with more current and sand than we had before experienced, and the water discoloured. Three charges only fired, from the difficulty of finding the holes, but removed 1715 cubic feet of stone, the greatest quantity yet taken up.

29th.—Tried a raft, with a small iron windlass, as a weighing boat, which worked very well, but requires seamen and a European to manage it. Removed 1620 cubic feet of stone, though the current was strong from the south. We had previous to this been principally engaged on the south side of the reef, as being the most sheltered, but now ordered the work to the centre and north. A boat arrived from Colombo, with timber and catamarans, the wood of the latter very spongy, and in an advanced stage of decay. The season is too far

advanced for others to be procured, I have, therefore, taken it and ordered two double catamarans to be formed for receiving the stones from the weighing boats, and two canoes. The blocks, &c. have enabled me to increase the power of our machinery, which now requires fewer hands, and has enabled us to spare what is necessary to man the extra number of boats.

30th. The boats employed as yesterday, and sixteen holes made in the rock ; the boatswain was ill with fever, and his party did not perform half the usual duty. I directed they should be kept at work every day, till the regular quantity was done, and the arrears brought up. Eleven charges were fired with excellent effect—three holes had been attempted on a rock having only a few inches of thickness, and sand below; they in consequence failed.

31st. The current has been running strong from the south, with no interval of slack water. The divers could not work, but six holes were made; the men having been carried away several times I ordered the boats to return, only two charges were fired after three hours hard work. About 900 cubic feet of stone was raised, a large quantity under such circumstances. Tried the Jaffna weighing boat again, but without success, she was only saved from turning over by the prompt aid of the other boats. The stone attempted to be raised was about 2000-lb. in weight, or a quarter of what had been done by the dhonies and tackles.

The result of this month's work, is, I trust, on the whole, as much as could have been expected, from the many delays we met with in the early part of it. This place affords no facilities, the most common articles had to be procured from a great distance, and not then without the utmost exertion on the part of the people employed.

Pamban is a village of 70 families, composed entirely of boatmen and pilots, who have no other occupation than what is furnished by passing vessels through the reef, loading and discharging their cargoes. There are no artificers, and the bazar consists of a few shops for the sale of provisions only; destitute of the most common articles which are generally to be procured in every other part of the country.

Artificers we had no difficulty in procuring from other places, but, on a sudden call, it was impossible to advance the work by the addition of extra hands.

The total failure of the means provided for under-water explosions, also, was the cause of most serious inconvenience, and obliged me to alter entirely the plan of operations. Our supply of tin tubes would

have been expended in a few days, and, neither in this place, nor any where near it, could bamboos or reeds be procured. I was obliged to break up the canisters for containing the charges and substitute leather bottles in their place ; this, with collecting the remains of the tubes after the explosions, has hitherto enabled us to continue the work. A supply of gun-powder must be received in a few days, there being but little remaining, which will necessarily stop the work, and a provision has I hope been made for this in time to prevent it.

Nothing, I trust, is now wanting to prove the certainty of success (if prosecuted) of this most important work, and though the extent of rock to be cleared is double what was at first supposed, still the expense will be trifling, in comparison with the advantages derived. If the testimony of the merchants of this part, and the masters of vessels, is to be taken, there is no public work now in progress looked on with more satisfaction than this.

1st April. The jumper, borer and shamrock, the latter a raft formerly used to remove the stones taken up by the windlass on the sapper, were out-boring to-day, with eight parties of sepoys—thirteen holes were made 2′ 9″ deep. The shamrock is not tarpaulined, but it worked very well. I sent out three catamarans to attend the sapper. The sapper and catamarans returned at 10 A. M., having done nothing. I laid down, at half past three A. M., eight more buoys to the southward, which nearly completes the right side—the total space included between them is 510 yards. Tried the current at half past two P. M.

S. reef 1st trial, feet 120′ in inches 50″ or $1\frac{5}{8}$ miles per hour nearly.
,, 2d do 120′ in do. 45″ or $1\frac{9}{11}$ do. do. do.
,, 3d do. do. do. 45″ do. do. do.
150 yards N. of N. reef 1st trial, feet 120′ in inches 45″ or $1\frac{9}{11}$ miles per hour nearly.
300 do. do. 2d do. 65″ or $1\frac{4}{11}$ do. do. do.
,, do. do. 3d do. 58″ or $1\frac{2}{5}$ do. do. do.

The two dhonies removed $48\frac{1}{2}$ tons of stone, measuring 728 cubic feet.

3d. The sapper, shamrock and borer proceeded to-day to the north of the northern reef. Eight men at the magazine raised one of the stones supporting the roofs, by means of two palmyra props and wedges ; there was no foundation on which the props could rest ; a stone sleeper was therefore placed at the depth of 5 feet. The two dhonies removed from the channel 43 tons of stone, measuring 730 cubic feet.

4th. There was great difficulty this morning in obtaining any divers. The men were consequently employed till nine A. M. in the small channel. Went out at seven A. M. with six leather cases, with

hose attached, lately sent by Captain Cotton; not one went off, but the hose had burnt to the nozle of the cases; there it must have been extinguished, from the suffocating effects of the oil mixed with the resin, and easily absorbed by the powder in the hose. At eleven A. M. fired off a 10-lb. case. The dhonies were not in use to-day.

5th. The borer and jumper were employed on the northern reef, but only made together six holes during the day. The buoys I took so much pains about have lost their distances, and two have had their numbers stolen by the dhonies passing to and fro. The two dhonies with the sapper removed from the channel 1295 cubic feet of stones, weighing 87 tons.

6th. There was no blasting to-day, the jumper and borer proceeded to the northern reef, where they made twelve holes during the day, three feet deep—56 tons of stone were removed from the large channel, measuring 860 cubic feet.

7th. The wall of the new magazine was completed with a doorway; part of the old roof has been removed, being excessively dangerous and constantly threatening to fall—74 tons of stone were removed from the large channel, measuring 1100 cubic feet.

8th. The jumper, shamrock and borer were all out to-day, and sixteen holes were made. The sawyers have been employed in cutting up planks for the paumben out of the pieces of jackwood sent to us from Ceylon. Thirty-eight tons of stone were removed from the channel, measuring 570 cubic feet.

10th. The jumper, borer and shamrock were all out to-day in the large channel. The sawyers continued cutting up plank for the paumben. Eighty-six tons of stone were removed from the large channel, measuring 1290 cubic feet.

11th. The jumper and borer only were employed today—four sepoys were sent to the small channel—seven blasts were fired there today, which had great effect. There are, however, so many stones lying in the bed, as to form a serious obstruction to the larger description of cargo boats. I shall, therefore, use the small dhoney there, if it can be spared from the large channel—68 tons of stone were removed from the large channel, measuring 1040 cubic feet.

12th. As our powder is now nearly out, I am forced to limit the details of parties proceeding to the channel to blast. Twenty men were at the small channel today—the holes were fired off that had already been made. A great quantity of large stones are in the bed of the channel, that it would be necessary to blast, if required to drag them to any distance; but the small dhoney will be able to take them away without this additional trouble. One-hundred tons of stone were removed to-day from the large channel, measuring 1500 cubic feet.

13th. One dhoney was employed in the small channel, and did a great quantity of work; during the day a few more small blasts were fired, and 26 tons of stone were taken away, and out of the large channel 75 tons, measuring 1120 cubic feet. Besides the two dhonies and sapper, that are constantly employed in the large channel, I have lately kept the paumben at work in those places where fragments of stone have been blasted, and of these it takes away three or four heavy raft loads in the course of the day.

14th. The borer and jumper proceeded to the north of the north reef, where eight holes were made. The large dhoney, and sapper, with its tender, and shamrock, were employed on the southern reef, whilst the paumben proceeded to different parts of the channel in search of any loose fragments of stone. A party of sepoys were employed at the small channel with the small dhoney. They removed between them twenty-four tons of stone, whilst seventy tons measuring 1050 cubic feet were taken from the large channel.

15th. The small dhoney was employed at the small channel, and the latter is now quite free from obstructions of any kind. The large dhoney, with the sapper, removed from the main channel fifty tons of stone, measuring 750 cubic feet.

TABLE *of the Rise and Fall of the Tides, times of High and Low Water, and direction of the Currents at Pamban.*

Date.	Time of high water N. side of the reef.	Time of low water S. side of the reef.	Time of low water N. side of the reef.	Diff. between low and high water S. side.	Diff. between high and low water N. side.	Time the current changes from N. to S.	Time the current changes from S. to N.	Heightatwhich current turned from N. to S.	Heightatwhich current turned from S. to N.	Greatest difference of level of two seas.	REMARKS.
March 17	12 30 P. M.	9 20 A. M.	9 20 A. M.	7 In.	4 In.	3 15 P. M.	12 10 P. M.	1½ In	3½ In.	7 In.	A slight breeze sprung up at 8 A. M. from the N. E. by N. continued all day.
18	11 15 A. M.	7 10 ,,	7 31 ,,	8½	5	4 40 ,,	10 45 A. M.	2½	4	8½	do. do. N. E. do.
19	1 15 P. M.	8 40 ,,	9 0 ,,	10	6½	3 20 ,,	12 15 P. M.	3	4½	10	do. do. 11 A. M. do. do.
20	1 30 ,,	8 20 ,,	8 45 ,,	12	7½	5 0 ,,	11 30 A. M.	3	7	12	do. do. 9 A. M. N. E. by N. do.
21	2 30 ,,	8 0 ,,	8 20 ,,	1 11	9	6 15 ,,	11 5 ,,	4	10	1 11	A calm till 10 A. M. a slight breeze from the N. E by N. the rest of the day.
22	1 45 ,,	8 5 ,,	8 30 ,,	2 4	11½	6 30 ,,	10 45 ,,	4½	12	2 4	A very gentle breeze from the N. E. N. sprung up at 9 A. M. the wind during the morning varied from N. E. to W. by S. A spring tide this day; the current in the large channel running at 4½ knots per hour; small channel 3½ knots.
23	2 30 P. M	8 45 ,,	9 5 ,,	2 2½	1 2	6 30 ,,	11 30 ,,	7	10 0	2 2½	A slight breeze from the W. during the day.
24	3 45 ,,	9 10 ,,	9 30 ,,	2 9	12 0	6 15 A. M.	1 0 P. M.	7	1 4	2 9	do. do. N. the morning rather cloudy some appearance of rain.
25	3 20 ,,	9 0 ,,	9 30 ,,	2 11	1 5½	7 20 ,,	1 20 ,,	4	1 3	2 10	do. N. at low water the current in the small channel was running at 2¾ knots per hour.
26	4 20 ,,	9 10 ,,	9 30 ,,	2 7½	1 7	7 35 ,,	1 30 ,,	4	1 4½	2 7½	The wind has been very unsettled to-day, varying from N. E. to W.
27	5 0 ,,	9 45 ,,	10 20 ,,	2 5	1 5½	8 5 ,,	1 0 ,,	4	1 3	2 5	do. do. do. a few drops of rain at noon.
28	4 30 ,,	9 50 ,,	9 30 ,,	2 3	1 5	7 30 ,,	2 30 ,,	3	1 1	2 3	A calm till 12½ P. M. a fresh breeze; the N. E. sprung up and continued till after nightfall.
29	5 30 ,,	11 30 ,,	12 15 P. M.	1 10	1 5½	10 0 ,,	3 30 ,,	3½	1 3	1 10	A slight breeze in the morning from the N. freshened at 11½ A. M. and varying from N. to S. W.
30	5 40 A. M.	1 15 P. M.	1 40 ,,	1 6	1 2	10 30 ,,	0 0 ,,	4	0 0	1 2	The wind has been very unsettled, varying from N. to S. by W. the current did not change as usual from S to N.
31	5 45 ,,	3 10 ,,	3 50 ,,	1 4	10 0	0 0 ,,	0 0 ,,	0	0 0	1 4	The wind as yesterday—The current has continued to run from the S. all day.

Return of the Charges fired in the Pamban Passage during the Month of February 1837.

Date.	No. of holes	Average depth.	Diamr. of holes in in.	Line of least resistance.	Charges of each.	In what contained.	How fired.	
		ft. in.	ins.	ft. in.	lb. oz			
11	2	1 9	6	1 0	1 4	Qt. bottle	With 4 feet each of Bickford's hose.	Both blasts were surcharged, and besides a great many small fragments, four large blocks of stone were detached from the rock : they were fired simultaneously.
	1	1 6	3	1 6	0 8	Pt. do.	do. do.	Blew out the tamping, but split the rock.
	1	1 9	3	1 3	0 10	do. do.	do. do.	Produced a very good effect, and knocked off a large portion of stone into small fragments, fired simultaneously with the eight ounce charge.
	4	1 10	3	1 3	0 10	do. do.	do. do.	These four charges fired simultaneously produced a most excellent effect; there were two nearly out of water: the stone, within the range of these four blasts, was broken into small pieces besides some large blocks that fell into the channel, one stone of 3-lb. weight was projected to a distance of fifty yards. N. B.—Bickford's hose burns at the rate of a yard a minute nearly.
17	3	2 0	6	1 3	1 4	Qt. do.	With 5 of do.	These three went off with very good effect.
	4	1 6	3	1 0	0 10	Pt. do.	With 6 of the Engr. Serjt's. hose.	These four blasts fired, with the Engineer Serjeant's fuse have every one of them failed, but we managed to extract three of the bottles out of the four from the holes in which they were placed, the other was too tightly jammed.
18	11	1 9	3	1 3	0 10	do. do.	With 6 of Bickford's hose.	The effect of these was excellent; the stone in many places was split into small fragments. One failure, and that the only one, proceeded from the fuse being placed in one of the bottles that had been taken out of the holes where they had remained all night; the powder must have been slightly damaged for every particle of the hose down to the tamping had burnt. The small channel is now nearly completed to the desired depth and breadth.
	5	2 0	6	1 6	1 4	do. do.	do. do.	
25	1	2 6	6	1 6	3 0	Leather case	Bickford's hose.	The leather case was made in the shape of a bottle and well dammered over. One quart bottle did not explode in consequence of the fuse not having been fired, one was fired with Serjeant Reardon's hose and went off, one pint bottle was fired with the hose made at Madras and failed as usual. One quart bottle, the leathern case and the pint bottle with the same hose, were fired simultaneously—then one quart bottle and one pint bottle, and lastly three quart bottles, one proving a failure. The effect was very good, particularly where the leathern case had exploded, large pieces of stone being displaced—about twenty cubic feet must have been detached.
	5	2 0	6	1 6	1 4	Q. bottle	4 with Bickford's and the other hose made by Serjeant Reardon of the Sappers & Miners.	
	2	2 0	3	0 10	0 10	Pt. do.	With Bickford's & the other with the Engr. Serjt's. hose.	

Return of the Charges fired in the Pamban Passage from the 1st to the 31st of March 1837.

Date.	Numbers.	Depth of holes.		Diameter of holes.	Line of least resistance.		Charges.		In what contained.	How fired.	
		ft.	in.	in.	ft.	in.	lb.	oz.			
1	4	3	0	5	7	0	2	12	Leather bag	Bickford's hose.	One failed, but the cause not apparent, the hose had burnt to the powder, which was a little damp near the neck, without any visible opening; the others had an admirable effect and detached a large quantity of stone.
2	3	0	0	0	0	0	0	0	do	Bickford's	These charges were not registered, being on detached stones; the effect good.
4	6	2	6	4	7	0	2	8	Tin case	Portfire	Five were fired simultaneously, two failed from a tube being broken by the raft, the other had the portfire blown out by the concussion, the others were reprimed and exploded singly with good effect—the stone in some places heaped up to the surface.
	1	2	6	6	7	0	7	0	do	do	
	7	2	0	3	6	0	1	4	do	do	These were in the small channel, five were fired simultaneously, a method we now abandoned, as only one took effect; the portfires being started by the explosion of the first, they were then reprimed and fired in succession; the portfire of one went off on being lighted.
6	12	2	6	4	6	0	3	0	Leather case	Fuse sent from Madras	The fuse was divided into lengths of ten feet, but all went out, with the exception of one which exploded after 22 minutes: the oil covering the surface of the fuse appears to have penetrated to the powder which will not answer even out of water.
7	7	3	0	6	7	0	7	0	Tin case	do	Employed the fuse as a substitute for portfire; two cases failed from some powder being in the tube which burst them without firing the charges.

Return of the Charges fired in the Pamban Passage from the 1st to the 31st of March 1837.

Date.	Numbers.	Depth of holes. ft.	Depth of holes. in.	Diameter of holes. in.	Line of least resistance. ft.	Line of least resistance. in.	Charges. lb.	Charges. oz.	In what contained.	How fired.	
8	2	6	0	6	7	0	7	0	Tin case	Quick match	One case failed, being broken by the boatmen in pulling down; all the other exploded with good effect.
	3	3	0	3	7	0	2	8	do	do	
	1	3	0	3	7	0	3	0	Leather case	do	The leather case had been nearly cut through in tamping—water penetrated the powder.
9	3	3	0	6	7	0	7	0	Tin cases	do	One tin case failed, from the joint having been imperfectly soldered, one leather case from too much resin having been put into the dammer; the remainder had a very good effect.
	4	3	0	3	7	0	2	8	do	do	
	3	3	0	3	7	0	2	8	do	do	
10	3	3	0	6	7	0	7	0	do	Pipes & quick match	All the charges were fired separately, but the failures were greater than usual from the quick match having been injured, and the tube not perfectly light—the effect on the whole good.
	5	3	0	3	7	0	2	8	do		
	4	3	0	3	7	0	4	1	Leather cases	do	
11	3	2	6	3	7	0	2	8	Tin cases	do	All exploded with very good effect, but the 6-lb. charges were rather too great for the stones, which were broken into small pieces, occasioning greater trouble in removing.
	5	2	9	5	7	0	6	0	Leather cases	do	
13	4	2	6	6	7	0	6	0	Leather cases	do	The whole of the charges answered, though several required being primed again from the quick match going out—ultimately all were fired. The leather bags answered admirably, from giving to the uneven surface of the stones.
	5	2	6	4	6	0	4	8	do	do	
	3	2	6	6	7	0	7	0	Tin cases	do	
	1	2	6	3	6	0	2	8	do	do	
14	1	2	6	3	3	0	4	0	Leather case	do	All succeeded, and great masses of stone were thrown up high above water.
	2	2	0	6	5	0	7	8	do	do	
	4	2	6	6	5	0	7	0	Tin case	do	
	6	2	6	3	4	0	2	8	do	do	

15	6	2	6	3	4	0	2	8	do	do	The charges all answered, one very large stone was projected a distance of one hundred yards.
	4	2	6	6	6	0	7	0	do	do	
	5	2	6	6	6	6	6	$3\frac{1}{2}$	Leather case	do	
16	1	2	6	6	5	0	6	14	do	do	The current was exceedingly strong; one charge only failed, though several had to be relighted several times—a dangerous experiment. The 10-lb. charges had less apparent effect than the 7-lb. and may be accounted for as having a greater depth of water.
	1	2	6	6	7	0	10	0	do	do	
	3	2	6	6	6	0	7	0	do	do	
	1	2	6	3	5	0	2	8	do	do	
17	1	2	6	6	7	0	10	0	Tin case	do	Eleven charges were fired with the hose and quick match, the remainder with hose and small pieces of portfire attached to the end, which fell down the tube when lighted. This answered when the tubes were perfect, but if it met with any obstruction, the air sometimes blew it out. The charges were all ultimately fired and the effect good.
	4	2	6	6	7	0	7	0	do	do	
	11	2	6	3	5	0	2	8	do	do	
	3	2	6	3	5	6	2	14	Leather case	do	
	3	2	6	6	6	0	4	$10\frac{1}{3}$	do	do	
	2	2	6	6	7	0	7	5	do	do	
20	4	2	6	6	7	0	6	11	do	do	Two failures occurred to-day, from being obliged to use old tin tubes saved from the former explosions; some of the portfires were blown out by the air being suddenly exhausted by the heat of the portfires. On the whole the effect was good and no powder lost, having recovered the two cases, the powder dry though many hours under water.
	9	2	6	3	6	0	2	8	Tin case	do	
	2	2	6	6	7	0	7	0	Leather case	do	
21	2	2	6	6	7	0	10	0	do	do	One 10-lb. charge failed from the rapidity of the current which broke the tube, all the rest were exploded to the south of the reef.
	3	2	6	3	5	0	2	8	Tin case	do	
	5	2	6	6	6	0	4	$6\frac{1}{2}$	do	do	
22	2	2	6	6	7	0	10	0	Leather case	do	Employed quick match with a weight leading down to the powder, and two strings, one to light the other if it goes out.
	4	2	6	6	6	0	4	$5\frac{1}{2}$	Tin case	do	
23	4	2	6	6	7	0	10	0	do	do	
	4	2	6	3	5	0	2	8	do	do	Water perfectly transparent, could see the least stone at the bottom; found we were on a bed or field of levelled rock of a hundred feet in breadth; the charge of 10-lb. blew the tamping, and rose a column of water about thirty feet high, recharged with the same quantity of powder the holes still remained. The same having increased in depth about one foot, very little effect produced by the explosions; ordered the holes to be made five feet.
	1	2	6	6	5	0	5	2	Leather case	do	

Return of the Charges fired in the Pamban Passage from the 1st to the 31st of March 1837.

Date.	Numbers.	Depth of holes.		Diameter of holes.	Line of least resistance.		Charges.		In what contained.	How fired.	
		ft.	in.	in.	ft.	in.	lb.	oz.			
25	9	2	6	6	7	0	5	$11\frac{4}{9}$	Leather case	Pipes and quick match	These charges fired off the bed of rock, and with tolerable success; all exploded and much stone broken. Three heavy charges fired which made craters but no fracture in the field of rock; fired two small charges round these holes which enlarged them sufficiently for work.
	4	3	6	6	7	0	10	0	Tin case	do	
	4	3	6	3	7	0	2	8	do	do	
29	2	2	9	3	6	0	2	8	Tin case	do	Every ounce of powder had its proper effect; large stones were hurled to some distance in the air, but the stone is of a compact quality.
	7	2	9	6	6	6	6	$2\frac{4}{7}$	Leather case	do	
30	3	2	9	3	6	0	2	8	Tin case	do	Commenced blasting at 11 A. M. on the southern reef; the effect was excellent—we finished at 3 P. M. The jumper and borer were very unfortunate in their work to-day. In the morning the raft had been placed on a sand bottom, and only one hole was completed; in the afternoon the current was too strong for the divers.
	8	2	9	6	6	0	5	$6\frac{1}{2}$	Leather case	do	

Return of the Charges fired in the Pamban Passage from the 1st to the 15th of April 1837.

Date.	Number.	Depth of holes.		Diameter of holes.	Line of least resistance.		Charges of each.		In what contained.	How fired.	
		ft.	in.	in.	ft.	in.	lb.	oz.			
1	5	2	9	3	6	0	2	8	Tin cases.	With quick & slow match.	The effect was remarkably good; the first six were fired on the southern reef and the two others ninety yards to the south of the northern reef.
	3	2	9	6	6	0	4	$10\frac{2}{3}$	Leather case.	do	
3	1	3	0	6	7	0	10	0	Tin case.	Quick & slow match.	Four blasts were fired a little south of the northern reef—nothing but compact sand—the intervals between the holes were, however, completely blown away, the other five were fired opposite to No. 8 buoy; ninety yards north of northern reef; the effect was good, the stone having but slight adherence, split into numberless fragments, but the intervals between the holes were completely blown away.
	3	3	0	6	6	6	5	0	do	do	
	5	3	0	6	6	6	5	$13\frac{4}{5}$	Leather case.	do	
5	2	2	9	3	6	0	2	8	Tin case.	do	Three blasts took place opposite No. 2 buoy 270 yards north of the northern reef, the next three were a little to the north of No. 4, the next one was opposite No. 5, and broke the other two holes by the explosion, and the next four were between No. 8 and 9; the effect altogether was very good, the bed of the channel was ploughed up in those places where the blasts took place. The intervals between the holes were entirely blown away, and some stones of a quarter of a ton in weight were displaced.
	7	2	9	6	6	6	5	0	do	do	
	2	2	9	6	6	6	10	0	do	do	
7	2	2	10	3	6	0	2	8	do	do	The stone was split into small fragments there were very fine size, but the lined intervals were blown away.
	7	2	10	6	6	0	5	0	do	do	
	5	2	10	6	6	0	5	5	Leather case.	do	
8	1	2	10	6	8	6	10	0	Tin case.	do	Three blasts were fired eighty yards south of the north reef; the effect most excellent, three or four stones of two tons in weight were thrown considerably above the surface of the water. The other six, fired on the southern reef, removed a great quantity of stone.
	1	2	10	3	6	6	2	0	Leather case.	do	
	7	2	10	6	6	6	6	$10\frac{4}{7}$	do	do	

Return of the Charges fired in the Pamban Passage from the 1st to the 15th of April 1837.

Date.	Number.	Depth of holes.		Diameter of holes.	Line of least resistance.		Charges of each.		In what contained.	How fired.	
		ft.	in.	in.	ft.	in.	lb.	oz.			
10	7	2	10	3	7	0	2	8	Tin case.	Quick & slow [match.	The effect was good, although the stone was broken into small fragments; one case failed to-day from the quick match bursting the tube at a part where it had not been soldered.
	6	2	10	6	7	0	6	$4\frac{2}{3}$	Leather case	do	
11	1	2	10	3	6	6	2	8	Tin case.	do	Four charges were fired a little to the south of the southern reef, the effect was very good, and large blocks of compact sandstone were detached from the bed, the other nine blasts were fired on the northern reef, the stone being considerably soft.
	12	2	10	6	6	6	6	0	Leather case.	do	
12	6	2	11	6	7	6	5	$2\frac{2}{3}$	do.	do	Two blasts were fired 100 yards to the north of the northern reef, the rest 140 yards N of N reef. The effect produced was very good; the holes are now made considerably deeper than they used to be, and I do not think it exaggeration to assert that after a certain depth the effect increases in a greater ratio than the cubes of the same depths.
13	4	2	10	6	7	6	5	14	do.	do	Four charges only were fired off to-day about 50 yards south of the north reef. The effect was good but the stone was broken into small fragments.
14	1	2	11	3	7	6	2	8	Tin case.	do	Five blasts were fired 120 yards north of the north reef, and the effect was very good; some stones of pretty large dimensions were detached. The rest were fired 150 yards north of the north reef; two had an excellent effect, and the other three blew the stones into large fragments.
	9	2	11	6	7	6	5	$4\frac{4}{9}$	Leather case.	do	
15	10	3	0	6	9	6	5	$13\frac{2}{5}$	do.	do	One blast was fired 40 yards N. of N. reef another 120 yards N. of N. reef, and the rest 180 yards N. of N. reef, they all went off and produced very good effect, with the exception of one, the tube of which burst.

XI.—*Remarks on the use of Captain Kater's Altitude and Azimuth Instrument.* — *By Lieutenant* J. CAMPBELL, *Assistant Surveyor General.*

In the 20th volume of Jamieson's Edinburgh new Philosophical Journal, Mr. Galbraith has given a paper upon the powers and use of Kater's circle, which appears to be the first account of the instrument published.

After shewing the degree of accuracy with which astronomical observations may be made with so small an instrument, Mr. Galbraith remarks : " the deductions from these small but compact instruments are much more accurate, therefore, than from their size we had any reason to expect, and may be advantageously employed in many geodetical and astronomical operations with great success. Hence, the smaller sized ought to recommend themselves to scientific travellers, and to medical officers attached to foreign stations, who are anxious to distinguish themselves in geographical and astronomical researches."

The dimensions of one of these small circles in my possession, made by Robinson, of Devonshire-street, Portland-place, London, are as follows :—

The case is nine inches high and five inches square at the bottom, and, having pieces of brass for the levelling screws let into the top, it serves upon occasion as a stand for the instrument. The circles are three and a half inches in diameter, cut to 30′ on a silver arc. The vertical circle has two verniers which read to 1′, and the azimuth circle has three verniers which also read to 1′. The level is fixed to the back of the vertical circle. The telescopes are achromatic and magnify seven times, and the one attached to the vertical circle is fitted with two negative eye-pieces, one of which is diagonal, and a dark glass is adapted to each; this telescope has *four* wires, one vertical and three horizontal, which are convenient in taking altitudes, because a mean of three observations may be obtained without touching the instrument.

A stand with three legs, like that of a theodolite, with a plate to receive the adjusting levelling screws, with another to embrace the upper part of the screws to hold the instrument firm, would be a convenient support on some occasions, but a small table, or a bullock trunk, makes a very good stand, when no better is at hand.

The pocket box sextant is the only instrument which can be compared with the circle for portability, and that requires the aid of an

artificial horizon, and, consequently, no altitude can be taken with it above 60°—unless the instrument is made with a second index glass at right angles to the first, and has dark glasses fitted to the second eye hole, when it may be used to measure the sun's altitude when in the zenith with the meridional horizon, and in fact becomes a sort of portable zenith sector. Let A (Pl. 4, fig. 2) be the sun's place near the zenith, B the artificial horizon, and C the place of the eye, and the angle measured by the sextant, then will the sun's zenith distance be equal to half the angle A B C or

$$= \tfrac{1}{2}\,(180 - \text{L C})$$

$$\Theta', \text{Z D} = 90 - \tfrac{1}{2}\,\text{C}.$$

In using the circle, Mr. Galbraith says that Captain Kater has observed the latitude by a *single* observation of the pole star, with only a maximum error of —26″.

No doubt in the hands of so scientific an officer as Captain Kater, the instrument would be made to give more exact results than when used by other persons, but, without attempting to arrive at so much nicety, the instrument from rough observations, such as are likely to be made by travellers, can give results practically very useful, without wasting any more time that would be required with larger instruments.

The following observations for the latitude of Calingapatam were made by reducing the altitude of the sun's lower limb to the meridian by a common watch, the error of which was found by equal altitudes a quarter of an hour before and after the meridian passage.

1st	mean of	12 altitudes.		=	18°	19′	32″ N.
2d	do.	13	do.	=	18	19	34
3d	do.	8	do.	=	18	19	55
4th	do.	9	do.	=	18	19	9

5th by a watch without a second, wanting for the seconds.
Mean of 6 altitudes. = 18° 20′ 17″

The three latter observations were made very roughly to ascertain the maximum error possible to take place. In these observations all the work was concluded in 30 minutes, including the observations for equal altitudes.

Had a pocket chronometer been used, the results would doubtlessly have been much more exact, for an error of 8″. in the time, gives an error of 1′ in the latitude, if the hour angle is 20 minutes, as may be found by differencing the formula for reduction.

$$= \frac{2}{\sin 1''}\ \overline{\sin}^{\,2}\ \tfrac{1}{2}\,\text{P. cos. dect. cos. lat. cosec}\ \acute{\text{Z}}\,\text{D}$$

Error $= \sin \tfrac{1}{2}\,\text{P.} \cos. \tfrac{1}{2}\,\text{P.}\ \dfrac{\text{cos. lat. cos dec.}}{\sin \text{Z. D.}}\ .\ 2\,x''$ when x'' is the

error of the hour angle in seconds of space.

In surveying extended tracts of country, the circle may also be used with advantage, for, small as it is, from the fineness of its wires and steadiness, it is capable of as much exactness as those lumbering instruments the theodolites, as generally constructed in England for land surveying, beyond which purpose they are fit for nothing. In measuring six horizontal angles round a station, each angle being measured on a different part of the circle, after moving the instrument, the sum was but little less than 360° viz. = 359° 1′ 0″; whence it appears the instrument will measure an horizontal angle with only a maximum error of 10″, a degree of exactness to which no theodolite can generally approach.

From the readiness with which it gives accurate results for the latitude, the circle when used in surveying would make very apparent the error caused by neglecting the difference of latitude between the foot of the perpendicular and the parallel, or by taking the distance from the perpendicular as the difference of latitude, as is sometimes done in rough work. The amount of this error is shewn by the subjoined table computed from the formula.

$$\text{error} = \tfrac{1}{2}\ \pi''^2 \cdot \text{tang.}\ \lambda.\ \sin 1''$$

when π'' is the perpendicular in seconds of the equator, and λ' the latitude found by turning the distance from the perpendicular into seconds by Lambton's table.

Table of the error always subtractive from λ.

λ	PERPENDICULAR.					
	30′	1° 0′	1° 30′	2° 0′	2° 30″	30° 0′
5°	1″	3″	8″	11″	17″	25″
10	1.4	5	12	22	35	50
15	2	8	19	34	53	76
20	3	11	26	46	71	103
25	4	15	33	59	91	132
30	5	18	41	72	113	163

Now, as the error likely to be committed in using an indiffernt instrument is not likely to be more than thirty feet in sixty miles, the error, as shewn in the table, is too great to be neglected. This error may be more conveniently applied by computing a table in which as

a function the error is given of the difference of longitude, by changing the formula.

In the diagram (Pl. 4 fig. 3) let A D be the meridian of the first station, B C the perpendicular of any other station, then A being the pole, D C will be the parallel of latitude of C, and A D will be the co-latitude of E, and not A B, and B D will be the error or the difference of latitude between the foot of perpendicular and the parallel.

Take $A\,B = 90 - \lambda$

$B\,C = \pi$

$A\,C = 90 - (\lambda - x)$

$D\,B = x$. then by right angled spherics

we have

$$\sin(\lambda - x) = \sin \lambda \cos \pi$$

$$\sin \lambda . \cos x - \sin x . \cos \lambda =$$

dividing by $\sin \lambda$ we have

$$\cos x - \sin x . \cot \lambda = \cos \pi$$

and the $\cos x$ being nearly $= 1$, and substituting the value of $\cos \pi$

$$1 - \sin x . \cot \lambda = 1 - 2 \overline{\sin}^2 \tfrac{1}{2} \pi$$

$$\sin x . = 2 \overline{\sin}^2 \tfrac{1}{2} \pi \text{ tang } \lambda$$

and taking x'' and π'' for the sines

$x'' = \frac{1}{2} \pi''^{\,2} . \text{ tang } \lambda . \sin 1''$ which is the formula before given,—but the angle B A C is the difference of longitude between B and C, and in the right angled triangle A B C

$$\text{Tang } A = \text{tang } \pi . \sec \lambda$$

$$A'' = \pi . \sec \lambda \text{ and transposing}$$

$$\pi'' = \cos \lambda . A''$$

$$= \cos \lambda . \text{ diff. longitude}$$

substituting this in the last formula

$$x'' = \tfrac{1}{2} \delta''^{\,2} . \overline{\cos}^2 \lambda \text{- Tang } \lambda . \sin 1''$$

$$= \tfrac{1}{2} \delta''^{\,2} . \cos \lambda . \sin \lambda . \sin 1''$$

or become $\cos \lambda . \sin \lambda = \frac{1}{2} \sin 2 \lambda$

$x'' = \frac{1}{4} \delta''^{\,2} . \sin . 2 \lambda . \sin 1''$ from this formula the following table is computed x always subtractive :—

λ	DIFFERENCE OF LONGITUDE.					
	30′	1° 1′	1° 30′	2° 0′	2° 30′	3° 0′
5°	1″	3″	6″	11″	17″	24″
10	1	5	12	21	34	48
15	2	8	18	31	49	70
20	2	10	23	40	63	91
25	3	12	27	48	75	108
30	3	14	31	54	85	122

By using a table of this kind, the error may be corrected without any additional trouble, or wasting time in the niceties of the computation by the formula; if it is ever necessary to undertake a survey of any extent with the small circle, or to use inferior instruments, when others cannot be procured.

In sketching in a hilly country, like those which are common among the mountainous tracts of India, when it is difficult, and sometimes impossible, to ascend to the summit of hills, from the impenetrable jungle which generally clothes the sides, the circle becomes a very useful instrument, from the facility with which azimuths of the sun or moon may be taken with it; by which means an azimuthal triangulation may be carried on, with as much readiness as with a circumferentor, but with infinitely greater exactness.

In using the circle in this way the subjoined diagram will explain the method of operation.

Let A (Pl. 4 fig. 4) be the plan of a camp, from whence the hill stations D and C can be seen. Let B be a little hill from where D and C can also be seen. Let the distance A B be assumed as a base, and the distance guessed by the perambulator. Let the latitude be exactly ascertained at A, and also the angles B A C and B A D be measured from A, and also the angle between B and the sun's centre. Let the angles A B D and A B C be observed from B, then with the base A B the distance D C may be computed. From E, another camp beyond the range of hills D C, let the angle D E C be measured, and also the angle between the sun and one of the stations D or C. Then, if M express the meridian, the angle M E C being known, the angle M C E is also known, from the azimuth at E, and also the angle M C D from the azimuth at A, and, the distance D C being given, the triangle D E C may be computed. Again if F is another camp, separated from F by another range of hills, but from D and C can be seen, D E and C E can be computed in the same manner, and from E and F more points as G &c.

may be laid down, and the survey thus carried on without losing time in climbing hills, and the district may be sketched in while proceeding from camp to camp. After the detail has been completed, another observation for the latitude at the extreme of the survey in latitude, will give the difference of latitude between the last station and A, with an error of not more than 1000 feet at the utmost, and then from comparing the true difference of latitude with the computed difference from the assumed base, the true length of the sides of the triangles and the base may be found, without the trouble of measuring a base, even if a piece of ground to measure it on could be found in such a country.

XII.—*Observations on Professor* Wilson's *Historical Sketch of the Kingdom of Pándya, in the Sixth Number of the Journal of the Royal Asiatic Society.—By the Rev.* Wm. Taylor, *Member of the Madras Literary Society, and Auxiliary Royal Asiatic Society.*

The Editor of the Madras Journal of Literature and Science has been so kind as to refer No. 6 of the Journal of the Royal Asiatic Society to me, with a special indication to articles ix. and xix., affording me the opportunity of adding any remark respecting them. For this polite and gentlemanly mode of proceeding I feel deeply obliged, while I judge it to be expedient to avail myself of the privilege so accorded. It has also yielded me no small measure of satisfaction to find that any imperfect labours of mine attracted the attention of the Boden Professor of Sanscrit at Oxford; and were honoured with any remarks, in the way of discussion, from one so profoundly versed in the ancient classical language and history of the more northern portion of India. In the two volumes of Translations to which his observations refer, I am fully persuaded that there are so many indications of my very respectful esteem for that learned individual as not to need any laboured reiteration in this place: but I may express some regret, that, in cases wherein I somewhat differed from his conclusions, I had not more scrupulously weighed the exact force of every word, not merely as it would bear on the impressions of others, for they would readily perceive the respect which pervaded the writer's mind; but also as it might influence the person whose deductions were immediately concerned. The Professor will, I trust, pardon me any error, or indiscretion, or want of caution, of this kind, if it occurred, as possibly it may have done; and will in re-

turn receive the assurance that, on this ground, I very readily coincide in the propriety of his laying his hand a little heavily upon me, at the close of his note, to which in due order I purpose to add some further explanation.

I would now briefly notice in the same order the topics adverted to by Professor Wilson. The Madura St'hala Purana, of my Translations, and the Madura Purana of his documents are the same work. The "Pandion Chronicle," of my work, a name given by myself for distinction sake, is, to the best of my knowledge and belief, not to be found among the Mackenzie MSS. any more than the original of the "History of Karnata Governors;" but of this last the translation by Mr. Wheatley indicated No. 23 in the list at the end of article IX, is no doubt from that original. I have by me a rough translation on country paper of that MS. in Mr. Wheatley's own hand-writing, and, from respect to his memory, I went so far as to have a fair copy made from it, for the use of the press; until, in the actual comparison of the original and translation, I found the latter too paraphrastic to represent the original on my plan of proceeding, which was to give the original and translation on parallel pages, and to annotate or paraphrase afterwards: a mode of proceeding which I still decidedly prefer; because the errors of an annotator, if he fall into such, can be corrected, but a verbose, or paraphrastic, or indeed any thing except a close and literal, translation, corrupts the springs of knowledge at their source, and introduces error in its most specious, and with difficulty to be distinguished, form. I have the most perfect respect for Mr. Wheatley's talents and fidelity in saying so—for it was only in the just principles of translation that he erred; nor have I a particle less of entire respect for Professor Wilson in saying, that he has been susceptible of error, and in some instances I think has been mistaken from this source of erroneous deduction.

Adverting to the comparative antiquity or otherwise of "the chronology of Pandyan history," I now very readily state, as the result of more extensive enquiries, since I published the two volumes of translations, that I am prepared to yield considerably in the claims of antiquity which I had assigned to some events in the *Pandya* history. Something must turn on the question, whether the foundation of Madura was antecedent to the visit of Rama of Ayodhya to Ramesuram as the Madura Purana asserts, or whether it was posterior, as Professor Wilson, guided by a translation from one manuscript, had stated. I would however just in this place, leave the matter as Mr. Wilson has left it: remarking only that a single inscription of any grant by *Kuna-Pandiyan* with a distinct date, should we be able to meet with such a thing, would do more towards settling the question than a volume of mere dissertation.

With regard to the particular MS. and that passage of it which now stands forth so prominently, I could wish that the expression quoted by Professor Wilson had been softened. Being cut out from its connexion and printed in italics, it reads harsh, whereas the whole paragraph in the Prefatory Notice to the 2d volume of translations, would I suppose be by all admitted to be deferential in no ordinary degree. Every sentence, or member of a sentence, of any writer may be so used; but it is I believe an axiom among critics, that any expression so excided is not to be taken as indicating the spirit or meaning of the entire context. The point of the question is this, that several authorities traced up the lineage of the most early rulers of Madura, to a particular son of a particular patriarch (so to speak) among the ancestors of the *Hastinapuri* race of kings. The position assumed by Professor Wilson, if accurate, at once nullified the whole of these authorities. The particular passage is (Descriptive Catalogue vol. 1, p. lxxiv.)—"the founder of the (Pandya) kingdom according to the local traditions, was a person named *Pandya*, a native of Oude, and of the agricultural caste." But "the local traditions" as indicated by me (Oriental Historical MSS. vol. 2, Ap., p. 35) did not, to the best of my judgment, direct to such a statement; all my authorities were against it; and on tracing the matter minutely in the Descriptive Catalogue, the statement, or rather something like it, was found only in one MS. in the account of which (Descriptive Catalogue vol. 1. p. 188,) it is said, "amongst these (pilgrims) was *Mathura-náyaka Pándya** a man of agricultural tribe from the north of India, who colonized the country along the *Vygi* river and founded the city of Madura." The MS. itself on being examined did not fully bear out this statement; and that circumstance was mentioned, on its being discovered, in the simplest possible language, in a short note (Oriental Historical MSS. vol. 2. Ap. p. 39), of which Professor Wilson has used only the concluding words. The particular point turned on the word "Oude," and on the word "*Pandiya*," as denoting a man, or person so called, as a proper name, which two things are not borne out by the manuscript, and the importance of the discrimination rested in this fact, that if the position chosen by Professor Wilson was just, then all other authorities were wrong: a matter of some consequence to the discussions in which I was engaged. I may add that in the original of the MS. in question the translation which I gave in the above note, of *Vada désattilulla pándiyanákira vellázhan*, might have been still better and more accurately rendered "an ancient agriculturist in (or of) the north country." As before ren-

* Being translated, "the Madura lord Pandya."—W. T.

dered the specific country "Oude" was set aside, and the term Pandyan made an appellative (as it is truly is) and *not* a *proper name.* I was not then so perfectly conscious that the appellative *pándyan* should be translated "an ancient:" it was the Telugu language in which *pánta* as an adjective for *old* is familiarly common, which first brought the circumstance to my notice. In Tamil that word is now obsolete, though formerly in common use. I must add my conviction that the manuscript in question, as a compilation by a Christian servant of Colonel Mackenzie, has no claims to be regarded as an authority; but as the proof of this position could only arise from a translation of this MS. and also of the *Chola Désa Púrvika Cheritra,* by the same writer, I must rest that position for the present only on my own assertion. I regret that my very innocent use of the word "information" should have been construed into an "assumption—implying it is to be inferred verbal information:" it is properly the inference that is "gratuitous and mistaken," seeing that the assumption was never made. I had attentively read the Introduction to the Descriptive Catalogue, and could not but be aware of the statements contained p. xviii---xxi, quite sufficient to prevent any idea of the author's depending on mere verbal statements. I have yet to learn that the word "information" used in the Prefatory Notice to the 2d vol. O. H. MSS. is limited to *verbal* information; but if the inference were in any measure founded on what appears in vol. 2. p. 63., then I can appeal to that whole paragraph; borne out as it can be shewn to be by the Introduction and Catalogue: and, conscious of inward rectitude, and outward substantial accuracy, would solicit the Professor not to be needlessly annoyed by differences of opinion, which in the fair fields of literature when candidly and openly stated, are never considered to be censurable; but I expressly recall the words "verbal accounts of natives" in p. 63. because, without any allusion to that page, Professor Wilson has contradicted it indirectly, as if implied by the word "information" in the Introduction. That "the translations were the work as frequently of European as of native scholars as specified in the list attached to the sketch," is, most candidly speaking, not borne out by that list, wherein out of twenty-eight documents, the names of only one European translator is given, that is to say the name of R. Clarke, Esq. I readily add Mr. Wheatley as a second (though a slight inaccuracy is involved); for the rest either no names, or the names of natives, strictly such, appear. Now I trust the Professor will consider me not uncandid, when I make no comment on this discrepancy; but I must further add that in the Introduction to the Des: Cat: p. xxi, it is stated---"with a very few exceptions the translations are the work of natives alone." I bow with extreme deference to the name and authority of R. Clarke, Esq. who was here one of the best Tamil

scholars of his day; but in the first place it is perfectly well known that European gentlemen of Mr. Clarke's rank do not servilely labour at translations themselves, the rough work always being done for them by natives; in the second place I am sure, arguing *à priori* from the above reason and *á posteriori*, from the false translation ascribed to him, that Mr. Clarke did not write that passage, while his eye rested on the original paper, and his hand traced the alleged rendering by him---it would be a libel on that gentleman to say so; though it is none to presume that, in the general way, he may have passed and authenticated the translation by his signature, without reference to critical niceties; in the third place, I pledge myself that the exact words of the original manuscript represented in Roman characters, are given above, and not all the learning, ingenuity, and talent, even of Mr. Clarke could render them fairly in any other way than I have done. For these three reasons, to adduce the mere authority of a "*magnum et venerabile nomen*," as set off against a false translation, or to confirm a conclusion based on an erroneous one, is in my view irrelevant to the question.

If, quitting this particular instance, there were any person's translations that I would admit, it would be those of Mr. Wheatley, whose office and profession was that of a translator, not solely *de nomine* but *de fide*; yet his principle of accommodating to the ideas of Europeans, and paraphrastic rendering, comports not with my principles of translation; nor with, abstractedly speaking, correct principles of translation: if so without knowing any thing of Mr. Clarke's labours, what opinion could I antecedently have formed of native translations for Col. Mackenzie, of a portion of which in the Professor's own words, "the "value* is much diminished by the very imperfect manner in which "they have been executed, the English being frequently as unintelligi- "ble as the original: with a very few exceptions, the translations are "the work of natives alone."

I am bound to give the Professor considerable praise for the tact with which he handles an advantage given to him by a passing expression concerning the Supplementary Manuscript, which it is added, "we consider as trustworthy." But this expression is cut out from the context, as noticed before in a similar case, and so obtruded, by no means gives the sense of the entire connection in which that expression is found. It occurs, vol. 2 p. 75 while at p. 72, the particular discrepancy quoted by the Professor is discussed; the fictions (universal among *Hindus*) as to the long reign of *Vicramaditya* are also sifted, and reduced to something like order in various parts of the work: in p. 73 it is said "Vicramaditya ruled in reality about a hundred years," a large allowance by the

* Des; Cat: Intro: p. xxi.

way. The statements of the supplementary MS. were by no means implicitly taken; dates in MSS. are sometimes faulty from transcription, but a translator cannot alter them; and finally though a prevailingly favorable opinion is given of the Supplementary Manuscript, yet a doubt at p. 76 plainly appears, whether its testimony can be maintained, and at p. 77, the " submitting the evidence of manuscripts implicitly to the test" of the author's " own discretion," is expressly declined, and judgment left with the readers. Professor Wilson is quite right in exercising his judgment and discretion; and only unfair in his mode of treating the translator and commentator. That five names will not do for the record of 3000 years is certainly true; such a position of the Supplementary Manuscript was not intended to be designated as " trustworthy :" it was expressly noted unfavourably; but the Professor certainly knows that all *Hindu* accounts of Vicramaditya are extravagant; and the simple truth probably is, that, under the guise of a miraculously long reign, they wish to cover over a period disastrous to *Hindu* ascendancy, and derogatory to their country's glory. Accurate records of that period must be sought for elsewhere, and not from among the *Hindus.*

Being fully disposed to admit and believe that among the manuscripts of the Mackenzie collection there are many valuable documents, more so certainly than the Supplementary Manuscript, I shall hope to see the whole brought into full development. Abstracts, however they may serve to give a general idea, will not suffice in critical, or doubtful cases: either the original, or else a faithful, literal, and critical, translation becomes then indispensible. On this plan it would give me pleasure to be able to consider my previous humble researches with chiefly my own materials, as a sort of vestibule to the Mackenzie temple; or, if the idea may be better, as a porter's lodge to the park and mansion of a peer of the realm.

Adverting to the " Historical Sketch of the kingdom of *Pandya*" (Art. 9, No. 6, J. R. A. S.) it is not without great hesitation that I make any remarks; as far as personal considerations are concerned, I certainly would avoid doing so; but there is some tone of dictation and confidence in the Professor's manner; his name and authority confer of themselves a sanction of his statements; and hence a few comments may prevent mistakes in others, and ultimately subserve an important public object which I purpose to announce in the sequel. These considerations, chastened by the most entire respect for the high attainments of the Professor in Sanscrit literature, will guide my observations.

It is not strictly accurate to restrict the meaning of the term *Dravira désam* to " the extreme southern portion of the east-part of the peninsula," a definition which is besides so loose that it must in strictness exclude the *Chola desa* and *Chera desa* which it professes to include, and shut out all, but the *Pandya-desa,* which alone and by itself answers to the definition. The *Dravida-désa* would answer to our familiar use of the term Peninsula as regards extent. The common division, in reference to languages, which is made by intelligent natives into the *Panja-gauda,* and *Panja-dravida,* gives to the latter a measure co-extensive with the more classical term *Dacshin,* or the south. I am acquainted with one native authority which limits the term *Dravida* to the country wherein the Tamil language is spoken, fixing the northern boundary at *Tripeti.* Extreme minuteness of remark is not in this particular of consequence. A little further on the Professor has the following statement. " An adventurer named Pan- " diya of the *Velálar,* or agricultural tribe, first established himself in " that portion of the south to which his name was afterwards assigned." To this sentence is appended a note which gives the native *Hindu* statement, heretofore followed by me, by adducing the *Hari vansa* and *Agni Purana* as affording another, and as I conjecture better, account than the above ; but rejecting their authority, as far as I can perceive, for no other reason than the silence of the *Vishnu Purana,* or an omission in its genealogy. But it is an established axiom in sound criticism that an omission is not a contradiction. The statement which the Professor has thought fit to prefer to the native accounts has been before sifted, and disproved. It may be as well, notwithstanding, where to introduce a faithful translation of the context in which the discussed, and disputed, passage occurs; which is the following :

" That same *Rama* the king of *Ayodhya* making himself responsible, that the lying-legend *(Poyyána-purana)* which he had made concerning this place called *Ramésuram* was the true way to go to (attain to) heavenly bliss (*Mòcsham*) and having disseminated it widely in the north country, and in other countries, the people of all countries with great intensity of thought (zeal, or enthusiasm) went on this pilgrimage.

" In this manner an ancient agriculturist *(Pándiyánákira vellázhan)* of the north-country having set out on this *Ramesvara* pilgrimage came (thither). While coming, having seen this southern *Danda-aranya*-plain (wilderness of *Dandaca*) and this (*Pandya?*) wilderness plain, with the goodness of soil of this land, and the great rivers in this wilderness, and reflecting on the (degree of) fertility of soil in his own kingdom in the north, and the (degree of) fertility in the soil of this untilled land, perceiving further the goodness of this (latter) he arrived, and having bathed at this *Chethu* (isthmus, or bridge) of *Ramésuram,* completing his pilgrimage, and having paid personal homage to *Paradvása-rishi,* he proceeded, and arrived at his town in the north."

It is then added that he assembled his whole family (or tribe of dependents) and proceeding with them colonized the extreme south, *again establishing Ramésuram*, and then going westward, cleared the woody-ground on the banks of the *Vaigai* river, built a town with its complement of fanes or shrines, and appointed the rule of cultivation, by which a small revenue at first would be gradually increased from year to year, by receiving a larger proportion of the produce. There is, however, throughout no mention of this person's proper name, nor any specification of the particular country or "kingdom" whence he came.

Now, I should not suppose that this statement would be considered sufficient to set aside such authorities as the *Hari vansa* and *Agni Purana*, with that of other manuscripts given by me in the translations more than once referred to. The account is simply that of a native Tanjore Christian, ignorant of just rules of criticism, and exceeding the bounds prescribed to him by his religion, which would allow him to despise the superstitions of the heathen, but not haughtily to reject the evidence of documents, claiming to be historical, and to substitute his own possibly veracious legend in their place. With the assistance of the *Chola-desa purvika Cheritra* written by the same individual, the broadest proof can at any needed time be adduced of his unfitness, through religious prejudice, to discharge the office of an impartial historian, even though it should be of faults, follies, or errors. Of course, I do not think his Christianity concerned in the matter; for the same want of candour or rectitude that I should blame in a Porphyry or a Voltaire, I should blame in a native Christian, if I saw it taking a converse direction in its bearing on native annals; be their subject what it may. Unhappily, as I think, Professor Wilson reposed too much confidence in the dashing, free-thinking, statements of this native, as is very visible in the catalogue. A somewhat fictitious importance has devolved on the passage of the native author's book which has been in question; but remembering that Professor Wilson, while justly insisting that he found in the translation ostensibly by Mr. Clarke, traces of this interpretation, has given up any thing beyond that, I will close this discussion by stating my own full concurrence in his admission, in these words---"that Pandya of Oude," or "a northern Pandion;" had any personal part in the settlement of the country is equally improbable.* Nevertheless the fact would have been received as undoubted, on the authority of Professor Wilson, had no counter-evidence appeared.

The next point which I consider it of any importance to notice, is the identifying *Kurk'hi* with the Kolkhi of the Periplus; and both, following D'Anville, with *Kilkhar* or *Kilakarai*, a sea-port on the Coro-

* Supplementary Note to Hist. Sketch, para. 4.

mandel coast. In the first part of the identification I am disposed to concur; in the latter part of it to differ. Notwithstanding the many cautions given by so many scholars on the subject of etymological deductions, they are not abandoned; yet they are not safe, without a knowledge of the vernacular language to which they refer. I have not No. 5. J. R. A. S. to refer to; and therefore can here only observe that *kilkarai*, simply means the east-shore; and is written கீழக்கரை, whereas கொற்கை *Gorrkai*, the native name of Madura in early times, has no other meaning, that I am aware of, and is radically a different word. In such a point however both D'Anville and Wilson might easily mistake by etymology. I should hesitate to hint even at any analogy between the name of old of Madura, and the distant Goorkhas of Nipal, had I not recently traced a resemblance between the Tamil alphabet and that of Thibet, as exhibited in some specimens from M. Csoma de Coros, given in the Bengal Asiatic Journal; and there may be added to this resemblance the fact that *Agastya* the acknowledged "father of the Tamil language" (that is, as I presume of its *written* language), was, according to tradition, a native of Thibet. Of course this resemblance must not be made the basis of any premature conclusion.

Any supposed discrepancy between the *Pandya Rajakal*, and the *Tiruvilliyádal*, on the spelling of the word *Chédi* in the former, with the *Setu-raya* of the latter may be easily obviated, without any necessity of adverting to central Hindustan. The Tamil language has properly no sibilant *s*—its own character corresponds with the first palatal letter in Sanscrit that is *ch*, and it is rather a modern erroneous refinement which tends to give the sound of *s*, rather than *ch*, to such words as சேது, which I have myself represented it is true by *Séthu*; but which would be correctly given by *Chethu*. Add that the த, which corresponds with the first Sanscrit dental letter *ta*, is by various persons written in English characters either *t* or *d*, the *u* final is very short, and if a person were to write by ear, he might write *Chedi* just as probably as *Séthu*: if a Telugu man, he would, I think certainly do so. Hence, the two authorities in the original characters I presume to be perfectly harmonious; and the difficulties to be experienced by a compiler from crude translations may receive some passing elucidation. In my copy of the *Pandya-rajakal*, accurately taken from one so labelled in the Mackenzie collection, I do not find the particular fact referred to recorded; but I am apprehensive that this is not the document referred to by the Professor; a supposition which I prefer to blaming the translation made use of by him.

The daily aerial visit of the Chola prince to the shrine of Sundarésvara, is not recorded in my copy of the Madura Purana. It has in it

marvels enough; but the aspect which it gives to the *one* visit of the Chola-chief, is rather construable into a well wrought piece of contrivance on the part of the Brahmans, and the *nodus* thought worthy of the god to untie, is the restoration of the seal on the temple-gate, which had been broken during the night. Copies may vary; and at best perhaps the tale is merely a gibe at "the shameless sect" of the hated *Samunar.*

I hesitate as to allowing no existing work to *Narkiren* the famous chief of the Madura College, at least on the reason alleged. The MS. on palm-leaves (Des. Cat. vol. 1, No. xxiii) entitled *Alakeswara-katha*, may at once be set aside on the ground assigned by Mr. Kindersley, but among the MSS. on paper there is one in a book,* No. 7, sec. 2, entitled *Alakesa raja Cadha,* apparently the one intended by Mr. K. to which however his remark in reference to difficulty will not apply, for in portions of it, there are verses in it dark as the Sphinx's riddle, and expressly so intended to be. Popular tradition ascribes this work to Narkiren, as a *jeu d'esprit;* but my own reason for doubting his authorship arises from the part which the poetess *Avvaiyar*, is made to take in it. A just deduction will I think place *Avvaiyar* much later than *Narkiren*; and a haughty *Brahman* who *(sic dicitur)* would not concede the palm to *Siva* himself, was not the person to do honour to a *Paria*-poetess.

With regard to *Agastya*, I believe, that many of the works imputed to him are not genuine; but I think so much is due to uniform tradition as to concede that an individual so named, first gave to the Tamil people a written alphabet, and some outlines of grammar, and this too at a very early period; though his labours were ultimately eclipsed and set aside, as regards grammar, by the *Tolcapiam* and *Nannul.*

The opinion given by Professor Wilson in the catalogue as to the existence of *Bauddhas* and *Jainas* at Madura, re-appears in the sketch, though very considerably modified. The translation by the Honorable G. Turnour, Esq. of the *Mahawanso* a *Pali* work, having since confirmed the conjectures thrown out by me in the two vols. O. H. MSS. as to the original identity of those two sects, I should not advert to the subject, were it not to state that I do not see, how for a moment the work of *Tiruvalluvar*, could even in conjecture be thought to have subserved the introduction of the *Jain* or *Bauddha* faith into Madura. *Hindús* look upon his book as quite orthodox. I may note

* I have not succeeded in tracing out this book in the Des. Cat: the document Sec. 2 Art. xxiii. p. xlii. App. vol. 2, seems to be only a duplicate copy of the other tale, and the contents do not accord with those of the five sections in book No. 7.

During the interval between writing this note, and correcting the press, *I have found the tale mentioned in the Catalogue, under the title of* Tamul Perumal Cheritra.—*By* Seyallar.

that the word *Kadal*, if not a misprint, must be traceable to very careless translation. That word in Tamil means *the sea* (being synonimous with *Samudra* in Sanscrit) whereas *Cural* is the title of the poem, denoting a particular species of Tamil versification.

I shall add no further observation as to the more modern portion of the sketch except it be to remark that, throughout in the subordinate running notice of the *Setu pati* and the *Maravas*, there seems to me to be some confusion or repetition; some anachronisms and errors: for example, the *Setu pati*, was at no time independent of the Nayak-dynasty of Madura; but was merely the chief feudatory. So much however at different times has been written by me regarding that principality that I need not add more.

To me the most striking portion of the whole sketch, is a note attached to para. 7. The account in that *para.* of *Malaya Dhwaja* might have been enlarged; but at present I have to do with the note. It is therein said that "the traditions of the south make him a more important character, and consider him as the father of Chitraganda the wife of Arjuna." The visit of Arjuna to Madura and his marriage there with the king's daughter is very fully recorded in my copy of the Tamil *Bàratham*, an abstract or prose-version of the *Mahabharata*; but whether to be borne out, or not, by the collated Sanscrit work, I cannot tell. However, there is not the slightest mention made of *Malaya Dhwaja*. The only question with me is, how did the Professor come at "the traditions of the South." Not by personal intercourse it need not be said, neither by manuscript authority, for that is not tradition, nor yet from Col. Mackenzie's assistants, for such of them as were at Calcutta were Telugu Brahmans, who never went very far south of Madras, and besides Professor Wilson has somewhat indignantly rejected the idea of trusting to verbal information from them. I know not where else to look for the traditions except in the first vol. of Or. H. MSS. where the conjecture is thrown out, and occasionally again and again referred to, as merely my own conjecture, arising from a notion produced, as I was going on with my work, that possibly the entire origin of the whole superstitious fable, in which a marriage is so conspicuous, might turn on the asserted visit of Arjuna to Madura. I certainly never heard it from any one, nor copied it from any book; and in the face of considerable difficulties I still think it plausible if not probable. Had not the Professor carefully barred out the idea of his having made any use of my assistance in his sketch, I should have thought that he had done so, my first volume of translations having reached England at the close of 1835. A doubt arose on the subject in various places, while reading that sketch; but especially in reference to this particular note. However, I may mistake; and will not be positive.

There are some matters of less moment in different parts of the sketch, which might be commented on ; but I forbear.

It is now due to the learned and indefatigable Professor to state that he has made a better sketch of the History of Madura of the olden time, than I should antecedently have thought to be practicable from his acknowledged materials. The general accuracy—in so far as native documents can be admitted to be authentic—predominates over the occasionally doubtful or erroneous portions ; and that there are a few errors in it tends not to reflect by any means on the Professor's labours, but to elucidate a point of some public moment which I announced my intention to develope. This is, that if there be any person in Europe who could educe, and set forth in order, the contents of the Mackenzie MSS. , Professor Wilson is that man. I do not think any one could vie with him ; yet since even his account of the plainest and best authenticated portion of Peninsular history is defective, owing to the materials wrought upon, then no person in Europe I conceive is qualified properly to give an adequate or fair representation of the contents of that collection. The full investigation of them in this country is perhaps the more important from the possibility of being made answerable for documents never contained therein. I have seen a production and a very clever one too, which, lauded by the *Atlas* as just the thing they would wish to see generally done in reference to the Mackenzie MSS., and transferred to the pages of the Madras Journal of Literature and Science, is yet, I will venture to say, essentially non-oriental, though quite western, in character ; and, with possibly some foundation in the Colonel's own Survey-papers in the Mackenzie collection, is yet for the greater part possibly the result of the able writer's own ingenuity and personal observation.

Should Professor Wilson follow out his expressed purpose of giving accounts, in the Journal of the Royal Asiatic Society, of the other Peninsular dynasties, before any thing of the kind may proceed from myself, there is no one else who would offer them a more cordial welcome, or read them with greater interest and pleasure. I should rejoice to receive hints or corrections from such a source. However, I retain my impression, long since announced, that the field is not ripe for the harvest of the general historian ; or for discussion and condensation. All original authorities, worth any thing at all, should in my opinion be printed in parallel pages, with faithful and literal translations. Annotations may be added ; but inferences or conclusions, in a general or final way, ought not to be drawn until the whole evidence is fairly and fully given. Then the judge and recorder may come, sum up, abstract, decide, and ordain ; but, as it seems to me, not at an earlier period.

ADDENDUM.

Subsequently to my having sent in to the Editor of this Journal the foregoing observations, I incidentally met with the number for January last of the *Asiatic Journal,* on the library table of the Madras Literary Society. It contains a brief critique on the second volume of Oriental Historical Manuscripts, little more than an echo of some statements of Professor Wilson, and in a tone of so much subserviency to him, that I might be at liberty to pass it by without remark, especially as I had written the foregoing, without knowing anything of an article seemingly composed with so studied an effort towards the depreciation of my imperfect production, which I should be the last to consider free from faults. But, since the writer of that critique expressly indicates an opinion that I had borrowed from the pages of the *Asiatic Journal,* it may perhaps be as well simply to deny the implication. Adverting to the Carnataca Chronicle the writer says—"the whole of the 'History' was given in this Journal ten years back, and we cannot help remarking that the co-incidence of expression in the two translations is so striking, that we are almost justified in asserting that Mr. Taylor must have had this version before him at the time when he executed his own. If not, we can only say it is one of the most miraculous instances of correspondence between independent translations of oriental works ever known or heard of."

I regret that I have not the volume of the *Asiatic Journal* referred to by the writer at hand, to compare with my translation, but, however miraculous the correspondence alleged to exist between the two productions may have appeared to him to be, one thing is certain, which is, that I had not the slightest knowledge whatsoever of the existence of such a paper until I met with this statement of alleged co-incidence, and implied plagiary. I think, however, that I am able to solve the enigma without having recourse to a miracle. In the preceding observations, towards the beginning, I have mentioned my having a rough paraphrastic translation by Mr. Wheatley of the Carnataca Chronicle, which I had intended to make use of. My intention, had it been fully carried out, was to have given him the merit of the translation, and to have added a brief sketch of his life and labors. In pursuance of that intention, I compared the translation and original; and, as both were to appear on parallel pages, I found Mr. Wheatley's mode of translation would not do. I then attempted to render his translation more literal by various alterations; a mode of proceeding which proved to be more tedious, and less satisfactory, than simple translation, to which I then resorted on my own principles. A page or two, however, of his translation, with my alterations, I sent to the press, and the first section of the Carnataca dynasty, possibly a portion of the second

section, gives the result of my attempt to act upon my first plan, which, to my regret, I was compelled to lay aside, and with it my proposed notice of Mr. Wheatley himself. Those who know the relationship in which I am placed towards that late excellent man, will readily comprehend why I wished to pay him a public token of respect, as well as understand my regret on finding that it could not be handsomely done. Now it is evident that the translation, which I then supposed had not passed out of his hands,* must have been copied out fair, and supplied to Colonel Mackenzie, seeing that the translation by Mr. Wheatley is enumerated by Professor Wilson as among his authorities. It follows also that very probably this same translation was printed in the pages of the *Asiatic Journal.* If such a supposition be true, it will also follow that the alleged miraculous correspondence, could not be so perfectly complete as is implied, nor could any co-incidence extend over the second section, except as to the facts recorded, which, in both translations, would be the same. I am not therefore uncandid when I infer, that the critic's comparison did not extend over the second section at the utmost; and that he was not very particular in his inspection is manifest from his singular caricature and omissions, as to the appendix to the second volume, which he professes nevertheless to define; as well as from the circumstance of quoting a passage as if from the Tamil, which in reality was a translation from Telugu. Indeed it may have been an object with him to deny to me any thing beyond " a familiarity with the Tamil language;" and, if so, to effect it he has taken a liberty with the passage, in quoting it, utterly unpardonable. The translation from the Telugu is (vol. 2 p. 205)—" In those days the Padshah (customarily) sent to all countries, &c." The critic's professed quotation says—" The Tamil author states that the Padshah (Mogul) in those days was accustomed to send, &c." Begging his pardon, the Padshah referred to was not the Mogul, and the words " the Tamil author" are quite gratuitous, and unwarrantable. Had he looked at the top of p. 190, he would have seen the translation expressly stated to be from the Telugu language. Further, when a critic says, " one of the anecdotes, &c. may be worth citing," it would of course be supposed that what follows in smaller type is a quotation: it is however no such thing. On reading it over at the Literary Society's rooms the thought arose—" are these my words"?—and comparison has proved them not to be so, but the critic's own abstract of what I wrote, and in abstracting he has made me amenable for language which I did not use, and which is anything but a translation of the original authority. To expose such glaring disingenuousness I should consider quite sufficient for the criticism. I must, however, regret the critic's attempt to make it appear as if I sought a comparison with Professor Wilson, who in " Sanscrit litera-

* See Oriental Historical MSS. Vol, I, Preface p, xvii.

ture," in "general learning," and "critical knowledge," I readily recognize to be my superior: if I claim any equality, it is in the moral attributes of truth and simplicity. When, moreover, in pursuance of his comparison by contrast, the critic says—"the one is an historian the other a translator"—I readily acknowledge this also; and, after so many indications as I had given, in the two volumes of Translations, of my opinion that in Hindu history we want literal Translations as the basis of future deductions, I wonder that he should have thought that I assumed the office myself of historian. Perhaps Professor Wilson has not assumed so much: if he has done so, the future historian, really such, will probably cut down his sketch to smaller dimensions.

I have, however, now done with the critic; and avail myself of the occasion offered me to translate, and thereby quote, a few pertinent remarks of Mons. M. A. Langlois in the Introduction to his French Translation of the *Hari Vansa*, published in 1834, by the Royal Asiatic Society. Mons. Langlois says—"It has seemed to me that the opinions of those who had occupied themselves with the ancient history of India, had always wanted a basis, and that, in being called to be their judges without having under our eyes the vouchers of the process, which they alone had consulted, we were obliged to yield an implicit credence to their assertions, often shaken by the contradictions themselves of their various systems. I have wished that it were possible to furnish criticism with the proofs of which it has need, so as to give to India that history, the existence of which, up to the present time, is doubted. I have not been able to believe that this people, which have existed so long, and occupy so vast a surface on the globe, who hold so distinguished a place alike in past and present times, could continue disinherited of their ancient annals: I have thought it to be needful to go and seek for these in India's own books, where they will be found often mingled with fables of every kind; and that, in translating these writings, it would be well to deliver over to criticism, frankly, and without any attachment to a system, the materials which ought to serve in this work of re-construction."*

These sentiments are the same, in other words, as those, more than once, asserted in my two volumes of translations; and since repeatedly maintained by me, both in the columns of this Journal, and elsewhere; without knowledge of M. Langlois's views, which have only very recently come to my acquaintance. Perhaps with a pardonable complacency he places himself at the head of those who shall follow after him in this plan of proceeding. I conceive, however, that the credit of the plan rests with the Royal Asiatic Society. They, as far as I know, first laid down the principle as to literal translations. Their idea struck me as just, and I followed in my imperfect measure. M.

* Introduction—*para* 2.

Langlois has done so ; only omitting the needful point of printing the text in parallel pages. I may add that the Honorable G. Turnour, whom I ought to place perhaps first, has followed the same system in his translation of the *Mahawanso,* and, allowing for others unknown to me, we have two scholars, and myself—a humble third labourer—acting on one plan, as nearly as possibly at one time, and in three very distant places on the globe. And we, with those that may join with us, shall ultimately prevail. When I most respectfully add the Committee of Papers of the Bengal Asiatic Society, and, as I believe, I may do, the Committee of Papers of the Madras Literary Society, to those who approve of this plan of proceeding, I do not mean to place them last and least, but to shew that there is as strong a re-inforcement as perhaps can be offered or expected. Premature historians will not stand the test of the results ; and sycophant critics will not impede them.

As regards the difficulties of translation in Europe, concerning which I have more than once offered an opinion, the experience of M. Langlois may also be adduced, though those difficulties are less as regards Sanscrit possibly than any other language of India. M. Langlois says,—" I am myself first to feel all the imperfection of my work, which has been performed from a text deduced from three manuscripts, not very correct ; of which two, the one Bengali, and the other Devanagari, belong to the Royal Library at Paris, and the third given by Mr. Tod to the Asiatic Society of London, was obligingly communicated to me. But no one of them had a commentary ; of which I but too often found the need. Phrases singularly concise, allusions incomprehensible, words unknown, have often stopped me ; and I ought not to flatter myself that I have always avoided the danger of shipwreck which they presented to me. I may have made mistakes ; but I venture to hope that the learned, who alone will perceive them, will be most ready to pardon me, appreciating, with a kindly feeling, all the difficulties which I had to overcome."* As an example of those difficulties, M. Langlois meets with the word, *Vasous (Vasus),* and in a note he asks " what are the " *Vasus* ? I avow that in this point, I can only form conjectures." I do not quote the example invidiously, far from it : for M. Langlois has done his difficult work, generally speaking, well ; but such are the difficulties to which scholars in Europe are liable. The text along with the translation, in parallel columns, would have, been desirable : and when India's own native works, fabulous, mythological, allegorical, poetical, and the like—always denying the epithet historical—shall have been, on that plan, duly and fully developed, either I greatly err, or India will cease to want a history.

* Introduction p. xv.

XIII.—*Horary Meteorological Observations made at the Equinoxes and Solstices, agreeably with the suggestion of Sir* JOHN HERSCHEL.

1*st.*—*At the Madras Observatory.*—By T. G. TAYLOR, Esq. *H. E. I. C. Astronomer.*

1837	Time.	Barometer.	Ther.	Direction of wind.	Strength of wind.	Weather.
June		inches	°			
21	6 A. M.	29.854	86.3	——	Calm	Cloudy—drizzling rain.
	7 ,,	.880	81.6	——	do	do do
	8 ,,	.900	80.1	N. W.	Very gentle	do do thunder.
	9 ,,	.920	79.7	do	do	do do do
	10 ,,	.920	79.0	do	do	Cloudy.
	11 ,,	.912	82.6	W.	do	do
	12 ,,	.900	84.0	W.	do	do
	1 P. M.	.883	83.8	N. W.	do	do
	2 ,,	.860	85.0	do	do	do
	3 ,,	.880	85.2	do	do	do
	4 ,,	.845	85.0	S.	do	do
	5 ,,	.845	85.0	E. S. E.	do	do
	6 ,,	.852	84.8	do	do	do
	7 ,,	.872	84.2	—	Calm	do lightning to the W.
	8 ,,	.900	84.2	S. E.	Very gentle	Clear do
	9 ,,	.902	84.3	do	do	do do
	10 ,,	.920	83.5	do	do	Haze do
	11 ,,	.918	82.8	do	do	Cloudy do
	12 ,,	.892	82.4	do	do	do do
22	1 A. M.	.854	82.0	S.	do	Haze.
	2 ,,	.850	81.0	S. E.	Calm	Clear.
	3 ,,	.864	80.5	—	do	Flying clouds.
	4 ,,	.866	80.4	—	do	do do
	5 ,,	.876	81.8	S. W.	Very gentle	Haze.
	6 ,,	.886	81.7	do	do	Clear.
	7 ,,	.904	81.9	do	do	do
	8 ,,	.922	83.2	do	do	do
	9 ,,	.930	84.4	S. S. W.	do	do
	10 ,,	.932	86.3	W. N. W.	do	do
	11 ,,	.930	88.2	W.	do	do
	12 ,,	.922	88.2	S. E.	Gentle breeze	Flying clouds.
	1 P. M.	.910	88.4	S.	Moderate do	do do
	2 ,,	.900	87.8	S. E.	Strong do	Clear.
	3 ,,	.850	87.5	do	do	do
	4 ,,	.846	87.0	do	do	do
	5 ,,	.850	86.0	do	do	do
	6 ,,	.848	86.0	S. S. E.	do	do

2d.—At Hoonsoor, in Mysore.—By WM. GILCHRIST, *Esq. of the Madras Medical Establishment.*

Day.	Hour.	Dry thermometer Fah.	Wet thermometer.	Barometer.	WINDS.	CLOUDS, &c.	REMARKS.
June 21	6 A.M.	68.25	66.75	27.416—	S. W. merely perceptible.	Overcast.	Rain yesterday afternoon, thunder and lightning this morning—ground wet—feels raw and damp.
	7	68.9	67.5	.422—	do rather stronger.	Overcast with low nimbi moving N. E.	
	8	72.25	69.5	.448—	do light breeze.	Overcast—N. E. quarter dense cum-strati—S. W. quarter clearer.	
	9	74.5	70.75	.464—	do do do	Do. some low cumuli in various parts of the hemisphere.	
	10	75.5	70.75	.482—	do do do rather stronger than at 9.	do. low dense cumulo-strati, and nimbi in N. and in E. quarters, moving N. E.	
	11	77.9	71.25	.484—	do as at 10.	Low, dense cumuli and cum-strati, edges ragged, over hemisphere.	
	12	79	71	.464—	do occasional airs.	Overcast—cumuli over hemisphere, but smaller and less dark	
	1 P.M.	80.5	71.25	. 45—	do light breeze......	Large, dense dark cumuli and cum-strati over hemisphere.	Sun obscured—no shadow.
	2	76.5	70.5	.434—	W. by N. breeze.	Nimbi.	Do.do. rain commenced quarter to 2--has been raining in the vicinity last hour.
	3	75.5	71	.414—	W. by S. do	Overcast—dense cumuli and cum-strati.	Rains N. E. and E. quarters.
	4	77	70	.412—	S. W. do	do cum-strati around horizon.	
	5	74.5	68	.412—	S. W. do	do do do do do	
	6	72	67	.410—	do. do	do do do do do	
	7	71.75	67	.442—	do light breeze	do strati near horizon.	
	8	71.1	67.25	.434—	do do do.........	do a belt of cloud extending from S. W. to N. E.	Lightning to the eastward.
	9	70.5	67.25	.444—	do do do.........	Overcast—stars faintly seen.	
	10	70.5	67.75	.464—	do do do.........	do do do	
	11	70	67	.464—	do airs	do banks of whitish cloud in various quarters.	
	12	69.25	67.25	. 45—	do breeze............	do do do do do	
22	1 A.M.	70	67.5	.452—	do do	do low ragged edged cumuli moving N. E.	
	2	70	67.5	.420—	do light breeze	Nimbi, scud, moving N. E.	Drizzle.
	3	70	67.25	.434—	do do do.........	do do do do	do.
	4	69.5	67.25	.420—	do do do........	do do do do	do.
	5	69	67	.416—	do breeze	do do do do	do.

Day.	Hour.	Dry thermometer Fah.	Wet thermometer.	Barometer.	WINDS.	CLOUDS, &c.	REMARKS.
22	6	69	67	.434—	S.W. light breeze……	Overcast.	
	7	71.5	69	.436—	do airs	do. low, ragged edged cumuli moving N. E. In northern quarter an extensive bank of nimbi	
	8	72.5	69.5	.456—	do light breeze ……	Overcast, low, ragged edged cumuli moving N. E.	
	9	75.25	69.25	.480—	do do do………	do dense cumuli and cum-strati.	
	10	76	69.2	. 49—	do do do………	do do do do	
	11	77.5	70	. 49—	do breeze.	Overcast, except in S. E. quarter. Dense cum-strati near horizon. Nimbi S. W. quarter.	
	12	78.6	69.9	.486—	do do	All round horizon cumuli and cum-strati—zenith overcast—clear on part midway between zenith and horizon.	
	1 P.M.	80.9	70.25	.482—	do rather strong breeze.	In upper regions thin ragged cirri and strati, both stationary, lower regions cumuli, moving N. E. ……	Between the upper and lower stratum of clouds there appears to be electrical action—the latter frequently become ragged at edges and send off portions—subsequently become rounded.
	2	81.1	70.1	.470—	do do do do…	Overcast with dense cumuli and cum-strati. ……	Shadow on horizontal plane 3.214 inches, perpendicular being 6 inches long.
	3	79.5	70·5	.460—	do do do do…	do large dense cumuli and nimbi moving north-east, upper stratum of cloud stationary. … …	Rain to the northward.
	4	75	70	.456—	do strong breeze……	Nimbi. ……	Rain last half hour.
	5	73	69	.444—	do do ………	Nearly overcast, low clouds moving rapidly N. E.	
	6	72.4	69	.452—	do strong breeze …	Small nearly detached cumuli over hemisphere in upper regions—low thin scud moving rapidly N. E.	

Total quantity of rain during observations 0.191 inch, determined by weighing. The thermometers used were placed under a thatched verandah uninfluenced by radiation or reflection. The barometer at a window immediately adjoining having a northern aspect—the thermometers are correct—the barometer is .042 too high—the heights given are as read off without any correction.

The shadow was determined by an apparatus consisting of a rod of iron pointed at top, and rising perpendicularly to the height of six inches, exactly above the plane of a piece of wood $2\frac{1}{2}$ feet long by 2 inches broad. At each corner of the wood a screw is placed by way of foot; by which is effected the adjustment of the upper surface of the wood to the true horizontal as indicated by two levels attached to it at right angles to each other. In order to see distinctly the shadow, a piece of white paper was pasted on the upper surface of the wood, with every care to preserve a level surface. The termination of the shadow was pricked off at the respective time of observation, and the length between the mark and the semi-diameter of the wire was measured with the detached scale of a barometer vernier, which read off to 1-500th of an inch.

Hoonsoor is W. 13° south of Seringapatam, distant $28\frac{1}{2}$ miles, and is W. 5° N. of Mysore, distant 26 miles.

3*d.*—*At the Trevandrum Observatory.*—*By* J. CALDECOTT, Esq.

Date.	Hour.	Bar. corrected for tempr. 32.	Thermr.	Depress. of W. B. therm.	Dew point.	Direction of wind.	Velocity of do	Clouds, aspect of the sky and remarks.	Solar radtn.*
June			°	°	°				
21	6 A.M.	29.845	75.0	1.8	72.39	W N W	1.	Cum. and fl. cl. threatening from W.	—
	7	.855	75.3	1.7	72.85	N by W	3.	Overcast.	0.5
	8	.873	76.0	1.0	74.57	N W	1.	do.	0.75
	9	.878	77.2	1.7	74.82	W by N	1.	do.	—
	10	.893	77.9	4.2	71.9	N W by W ½ W	2.	Heavy cum. and fl. cl. threatening.	1.9
	11	.887	79.3	2.1	76.4	N W by W	1.	do. do. do.	5.75
	Noon	.878	81.5	3.8	76.25	do	1.	do. whole sky obscured threatening —squall of wind and rain from W. at 12*h.* 10*m.*	—
	1 P.M.	.881	79.2	2.8	75.31	N W	1.	Rather clear—flying clouds.	5.4
	2	.853	80.8	4.5	74.5	do	0.5	Overcast with heavy cum. rain at 2*h.* 30*m*—light wind N. W.	.95
	3	.839	77.0	3.0	72.73	W N W	1.	Overcast—cum.	Observations prevented by clouds and rain.
	4	.835	77.5	2.5	74.	N W	1.	do. do.	
	5	.838	77.2	3.0	73.	N W	1.	do. do. raining.	
	6	.843	76.4	2.6	72.65	N W by W	1.	do. do.	
	7	.864	75.7	2.2	72.54	do	1.	do. flying clouds about zenith.	
	8	.884	75.7	1.7	73.26	do	1.	do. do. do.	
	9	.899	75.5	1.5	73.37	do	1.	do. do. raining.	
	10	.909	75.4	1.4	73.4	do	1.	do. do. do.	
	11	.905	75.0	1.0	73.55	do	1.	do. do. do.	
	Midn	.895	75.0	1.0	73.55	do	1.	do. do. do.	
22	1 A.M.	.873	75.1	1.4	73.0	N by W	1.	Overcast.	
	2	.848	74.2	0.8	73.0	N	3.	Light cum. in zen. heavy at the hor.	
	3	.842	72.6	0.0	72.6	do	4.	do. pleasant breeze.	
	4	.849	72.6	0.1	72.5	do	4.	do. do.	
	5	.853	73.5	0.5	72.77	do	3.	Overcast, do. drizzling.	
	6	.870	74.0	1.4	72.0	W S W	4.	Heavily overcast and raining.	
	7	.885	73.5	1.0	72.0	W S W ½ W	2.	do. do.	
	8	.906	73.7	0.7	72.69	do	2.	do. do.	
	9	.920	74.5	0.9	73.22	do	2.	do. do.	
	10	.943	75.7	1.2	74.0	W S W ¼ W	2.	Fl. cl. in zen—cum. about the horizon.	
	11	.942	76.0	1.5	73.9	N W by W	1.	do. do. drizzling.	
	Noon	.931	75.0	1.5	72.84	W N W	2.	do. do. raining.	
	1 P.M.	.921	74.0	1.3	72.1	N W by W	2.	do. do. do.	
	2	.903	75.7	1.3	73.85	N W	1.	do. rather clearer.	1.95
	3	.892	76.5	2.2	73.37	do	1.	Overcast.	0.5
	4	.891	77.2	2.7	73.3	N W by W	2.	do.	0.5
	5	.893	76.4	2.9	72.22	N W	3.	do. raining.	—
	6	.895	75.7	1.7	73.26	do	1.	do. drizzling.	—

*NOTE.—These two days were unusually obscured—the actinometer on the four preceding days indicated *at noon*—7,75—12,6—12,25 and 2,25 respectively.

June 21st.—Fall of rain from 6 A. M. to 6 P. M. .... .201
,, 22d.—do. 6 P. M. to 6 A. M. .... .8835
do. 6 A. M. to 6 P. M. .... .5893

Total in the 36 hours...... 1.6738 inches.

No thunder nor lightning.

EXPLANATION.

The barometer is the same as was used in the Trevandrum Observations on the 21st and 22d March; in the account of those observations it is mentioned that it appeared to be an instrument worthy of confidence, from a comparison of it made with a fine syphon barometer by Robinson :—it may be as well however to explain that this opinion was formed from the regularity of their differences only; that

comparison not establishing the zero-point of Wrench's instrument—the other by Robinson not having been compared with any standard. The latter, however, being one of the syphon kind, may be considered free from most sources of error to which the other is liable, except those arising from the sp. gr. of the mercury, and any error in graduation, and those are not likely to exist in an instrument carefully made by so first-rate an artist. This comparison showed a difference of .007; Wrench's being in excess of the other by that quantity, before any allowance was made for capillarity—with the addition of .075 on this account, the difference was .082. This difference was not attended to in the March observations, nor in these; the observations being left as they are, for a future certain decision of the true zero-point. The correction for temperature is made as before and the same constant .075 is added for capillarity.

The thermometer is the same standard one by Troughton as was used in March, the moistened thermometer is also by the same maker, but indicating 1° higher previous to applying water to the bulb; this has been allowed for in the column of depressions. The dew points are calculated from Professor Apjohn's formula $f'' = f' - \frac{d}{87} \times \frac{p}{30}$ disregarding the correction $\left(\frac{p}{30}\right)$ for pressure—which in this case is insensible.

The direction of the wind is shewn by an anemoscope, and the numbers in the eighth column express by estimation its velocity in miles per hour.

The solar radiation—or the direct heating power of the sun's rays—is measured by a Herschel's actinometer (an account of which is published in the third report of the British Association) and, as affording an interesting comparison of the intensity of the solar rays at the four opposite seasons of the year in this climate, the observations with this instrument will be continued.

The time is the true mean time of the Trevandrum Observatory, in latitude 8° 30′ 35″ north, and longitude 5*h.* 7′ 59″ east.

The elevation of the situation in which the March observations were made was by mistake in copying, stated to be about 50 feet instead of about 150 feet above the sea—the true elevation at which they were made has since been found to be 138¼ feet. The instruments are now placed in a building erected expressly for the purpose, in which the radiation and reflection of heat, and every other disturbing cause, are carefully guarded against. It was in this building that the present observations were made, and the cistern of the barometer is ascertained by actual levelling to be 177¾ feet above the level of the sea (distant in a direct line about two miles). The heights of the mercurial column given in the register are therefore those due to this elevation, corrected for temperature and the bore of the tube, but liable to a future correction (of some small amount) on account of the zero-point.

XIV.—Notices of Books.

Transactions of the Agricultural and Horticultural Society of India. Vol. 3d.—Printed at the Serampore Press, 1837—pp. 320, 8vo.

(Second Notice).

At the conclusion of our last notice of this work, we promised to examine the commercial section in this number, and consider, somewhat in detail, the numerous papers connected with the cultivation of Cotton and Tobacco, as objects, in a commercial point of view, of primary importance.

The papers in the volume, more or less exclusively devoted to the consideration of these two plants, amount in all to twenty-one. Of these twelve make no reference to tobacco; five none to cotton, and four refer to both. We shall first consider

Cotton.—The first paper is a letter transmitting a bag of "Vine cotton seeds," said to be a very superior description of cotton, but of rather too long a staple! which from tending to weaken the fibre, lessens in some degree its value. The seeds were sent to Gowhatty in Assam, and to Mirzapore. It is to be hoped, should this first supply succeed, that we shall soon have an opportunity of trying it in Madras from seeds of Indian produce.

The next two papers on cotton, are letters from Colonels Colvin and Skinner, communicating the results of experiments for the introduction into the upper provinces of Upland Georgia cotton; the exertions of both of whom seemed to promise a very favourable result, but the matter was still doubtful at the period of writing. It seems strange on this side of India, in the inland districts of which the Bourbon cotton plant almost every where thrives, that it has not been more generally introduced in the upper provinces of Bengal. Here it is found a hardier and more productive variety than the Upland Georgian, and the produce higher priced in the English market by some pence, than the Georgian raised on the same lands, or in varying soils in the same tract of country. The fourth notice is a letter intimating the dispatch of a case of Peruvian cotton seed from Liverpool. The cotton is said to be very fine, referable to the long staple class of cottons, and worth about one shilling the pound at the time of dispatch; none of that kind, we believe, has yet reached Madras.

At Allahabad trials of Sea Island had failed, apparently from the seed being bad, but, in the neighbourhood, some Pernambuco seed had been sown and was most thriving. Transplanting had been tried to

some extent, and most successfully. That species, the *Gossypium acuminatum* of Roxburgh, bears transplanting well—some which we have in our garden has been twice transplanted without the slightest injury. We consider that a very desirable species to introduce extensively into cultivation, as being a large and vigorous plant, and a free grower, which may be subjected to almost any treatment, except perhaps too rich and moist a soil. In its culture, free pruning seems quite indispensable to the production of large crops, and we believe it may be annually cut down to the roots, though the better plan appears to be, merely to shorten all the larger lateral branches, as well as the leading stem, during the hot season, after the crop has been gathered, which will always ensure an abundant supply of fruit bearing branches without over crowding the ground.

The next paper on cotton is by Mr. Bell, but, being of a controversial nature, we shall for the present pass it, and return to the subject when we have glanced at the remaining papers on the cultivation of cotton.

Part of the Peruvian cotton seed, before mentioned, was sent to Mr. McLeod of Seonee, along with some Egyptian; both vegetated to a greater or less extent, but, owing to the very wet unfavourable season, a failure was anticipated in both cases, but, as both were expected to produce some seed, it was hoped future trials would prove more successful.

This paper is immediately followed by an interesting one on the culture of cotton in Bundlekund. It consists of a series of questions by Mr. Hodgkinson, and replies by Mr. Bruce. From it we learn there are five kinds of soil, the best of which is the *maura*, or black marl, the rent of which varies from one rupee thirteen annas, to two rupees eight annas, per beegah of 18,225 square feet—that some of the best *maura* lands will produce as high as nine maunds of seed cotton per beegah, one-third of which is cotton and two-thirds seed, but the average for that kind of land is only half that quantity—that the average cost per beegah of four different soils, including rent, several ploughings and seed, is rupees 3-13-2½, producing upwards of a maund of cotton, which, if well cleaned, and of fair staple, would at any time realize twelve rupees per maund. The concluding paragraph we quote entire, as showing the injurious effects of high assessment.

"When I first came into Bundlekhund, I was in the habit of making advances annually to the ryots for cotton, in the months of July and August, generally at eight rupees per maund, upon the security of the zemindars of their villages. As long as the government assessment was moderate, and the landed proprietors in easy circumstances, the system was profitable and answered remarkably well. This cotton

seldom cost me more than ten rupees a maund, including balance and establishment. The contracts being for the first produce of the fields, it secured me cotton of a most superior quality at a cheap rate. I was obliged, however, to abandon the system altogether when the government assessment was raised. As the zemindars and ryots became impoverished, so the risk of balances increased, and rendered the speculation precarious. As long as landed property remained valuable, the security of the zemindars was considered safe, but they are so poor now, that advances made upon such security would be hazardous."

This is followed by two short communications on Egyptian cotton by Messrs. Gibson and Bell. The experiments of Mr. Gibson for its introduction had in a great measure failed, from the extreme wetness of the season, but, at the time of writing, the experiment could not by any means be considered as brought to a close, so that no conclusion can yet be deduced from it. The same may be said of Mr. Bell's remarks, except in so far as they show what liberties in the way of transplanting may be taken with it, some plants having twice undergone the ordeal, the last time when full grown and covered with pods, apparently without inflicting the slightest injury, but rather with benefit, as Mr. Bell says, " I remark that all the pods which have been latest in coming to maturity are the largest and best." He concludes by giving it as his opinion, that, if attended to, Egyptian cotton will not only flourish, but yield abundant returns throughout India, and recommends its being tried on an extensive scale.

Captain Jenkins, writing from Gowhatty in Upper Assam, thinks that the Egyptian cotton has failed there, though the plants have grown well, as none of the pods had then ripened. This may prove a premature conclusion.

We cannot help remarking the number of instances of half finished experiments recorded in these transactions, a system we cannot approve of, as such records can lead to no useful conclusions.

We mentioned *en passant* that one paper from the pen of Mr. Bell was of a controversial nature, and that we would return to it; we now do so, considering the subject one of such magnitude, both in its commercial and agricultural bearings, as to merit even a much more comprehensive examination than we can now bestow on it. Mr. Bell's paper is entitled, " Remarks on Dr. Lush's memoir on the cultivation and preparation of cotton in the districts under the Bombay presidency." As we are no parties to the controversy, and as we believe many of our readers are ignorant of its merits, or even of its existence, we shall, in the first instance, present an abridged view of the arguments on both sides, and then make our own comments, beginning with Dr. Lush's paper, which comes first in order.

It opens with an enumeration of the species, botanically speak-

ing, of the genus *Gossypium*. He, following, but going beyond Dr. F. Buchanan Hamilton, reduces the whole series to two, doubtfully three. Hamilton has three, one of which he reduces. Mr. Lush's two species may be distinguished, the first, by having the seeds in each cell of the capsule distinct; the second, by their being combined, and more or less strongly adherent, into a single conical shaped body: neither the ever-varying forms, duration, nor native country of the plant, nor the colour of the cotton, or absence, or presence, of fur on the seeds,* have any weight with him in forming specific differences. The free or combined seeds is his only character; at least such we infer to be his meaning for he does not state it very clearly: hence all our native, or, so called, country cottons, and the long list of introduced nankeen and American sorts, are considered only so many varieties of a single species. The inference from which, at least as we understand him, is, that—as all these varieties are apt, under change of circumstances, to undergo a change of character, and pass from one variety into another, or into new ones, more or less valuable, according as the alteration of soil, climate and culture, has been more or less suited to draw forth the best energies of the plant—it is fruitless labour to try to introduce these foreign varieties into India: for, unless we can provide them with a nearly identical soil and climate, which it is assumed we cannot do, they will speedily revert to the forms now in cultivation, or even deteriorate below that standard, though cultivated with the care and cost of an expensive exotic: and, lastly, that to bestow such pains on an exotic would be worse than useless, because our formerly much despised Indian staple, as it is, daily rises in estimation, and is in such demand for the China and English market, that the quantity exported has risen from eighty or ninety lakhs to three crore of rupees annually, and that now, Surats greatly inferior to those which in 1829 were quoted at $3\frac{5}{8}$ are valued at from 6*d.* to 7*d.* per pound, and the superior sorts, though badly cleaned, fetch a price fully equal to that of Upland Georgia of 1829, owing to the rise of price having suggested new modes of separating the impurities at home, and has rendered a dirty short fibred cotton not so bad an article: therefore, since 5*d.* a pound will give the merchant and grower an ample profit, and while there is so little difference between the price of a dirty and clean cotton, why take the trouble to attempt to alter this comparative ratio, or why need we fear compe-

* M. Jacquemont writes him on this subject, 'I am very sceptical about *Gossypii* species, such as *G. Barbadense*, *G. Arborium*, *G. Vitifolium*, and I do not see any thing in your *G. Cuspidatum* calculated to shake my scepticism, I would swear to *two*, but not even to *three*.'

"However, I confess my scepticism was not confirmed, until I saw further the results of cultivation of American cotton in an experimental farm, and the conversion of green-seeded American into black-seeded cotton like Bourbon."

tition with America, since we know we can stand up against a great reduction of price below the present rates. The great object, therefore, is the extensive production of that variety of cotton in common use, as clean and as carefully prepared as may be consistent with cheapness; that an expensive article may be a fallacious improvement, and that an inferior article, if saleable at all, may be more profitable than a confessedly good one: and, such being the case with our short fibred inferior annual cheap cotton, it must still continue the great staple of India, since the supply of American long staples, must always be sufficient to meet the demands of the market, the proofs in support of these positions are adduced in subsequent papers, and, being superior to ours, will always have the preference.

We believe we shall not be accused of partiality in presenting the above as a fair, or rather indeed favourable, exposition of Dr. Lush's views, as stated in the two first parts of his memoir published in the *Bombay Courier* of the 11th and 15th October, all that Mr. Bell appears to have seen when he wrote his remarks.

Mr. Bell, in his reply, leaves the determination of the botanical question to be dealt with by botanists, but thinks "when Dr. Lush comes forward confidently before the public with a new theory, to which he is anxious all should subscribe, it is time to enquire upon what sort of foundation his hobby is built, and whether practical men will be satisfied with the soundness of his doctrines, when placed in juxta-position with practical proofs."

Alluding to a statement of the Editor of the *Bombay Courier*, that for thirty years fruitless attempts have been making to introduce the foreign varieties of cotton, he observes that it would have been more satisfactory, had Dr. Lush inquired into the causes of these failures, and given them to the public as a preface to his essay, in lieu of a vague theory "wilder, in his humble estimation, than the anticipation of the wildest enthusiasts," as he would then have laid the public under an obligation—that an extension of the principle would equally apply to the non-introduction of other foreign plants, as the Otaheitan sugar-cane, which has been successfully and advantageously introduced —that, whatever weight Dr. Lush's opinions may carry in Bombay, he hopes no one in Bengal will be scared from his good intentions in endeavouring to introduce superior productions, until better proofs are adduced by the publication of the sources of failure. Why does not Dr. L. state on what experimental farm he observed the conversion of green-seeded American, into a black-seeded smooth cotton, and his authority for assuming that black-seeded cotton was in reality from green-seeded American? If there was so much attention paid to the transformation of seed, why was there not equal attention paid to staple?—practical men paying little attention to seed, provided the

cotton does not degenerate; and it by no means follows, that change in the external appearance of the seed is accompanied by depreciation of the quality of the produce:—finally, he rejects Dr. Lush's theory as chimerical, " because he has advanced nothing whatever to convince him, that it is easier to improve indigenous, than it is to establish, permanently and profitably, the superior staples of foreign countries." Dr. L., having mentioned the different qualities of some samples of cotton produced on different kinds of soil, namely, pure black, black sand, and black with nodules of lime gravel, the last infinitely the worst, he assumes, because the result is at variance with those deduced by Mr. Piddington from experiments, that he had not looked beyond the surface, otherwise he would have found a more formidable enemy to the improvement of indigenous and successful introduction of foreign cotton than soil, in the poverty of the cultivators (without however inferring that soil is not a powerful agent), and in their mixing other crops to make the soil yield its utmost; and quotes some instances in illustration from papers in the Transactions. He then goes on to observe that " the foregoing remarks sufficiently account for 'the mixture of dirt and leaves, and the shortness of staple', complained of in the dispatch of the Honorable Court of Directors to the Bombay Government in 1829, alluded to in Dr. Lush's essay, and is laid hold of to establish another important error which the Doctor, in his zeal to make converts to his views, has the indiscretion to publish, viz. 'The fact is, that the rise of price has suggested new modes of separating the impurities at home, and the dirty short fibred cotton now turns out to be not so bad an article.' "

To this it is answered, that, had the author digged deeper, and asked the cause of this extraordinary rise of price, " the answer would have been, extraordinary demand—and whence the demand? The answer would have come home to Dr. Lush, and all who are concerned in the prosperity of Indian agriculture. The skill of the English has ruined our Indian looms, and thrown some millions out of bread. The expensive machinery of the English must be kept going, and if they cannot get good cotton to work up to clothe those whom they have deprived of the means of earning a bare subsistence, why they must take bad, and as they are obliged to take what they can get, it is better that we should plant cotton than starve, and as we cannot afford to buy good cloth, the English will consult our means, and be keeping their wheels in motion, and men at work, by sending us cheap bad cloth." Hence the inference that though bad cotton, rather than none, it does not follow that if better cotton were introduced we should not find a remunerating market, and that, in proportion to the means of purchasing, would be the quality of the manufactured article.

The practical results adduced to prove that foreign cottons, superior

to the country ones, can be produced in India, and the probabilities of their becoming extensively cultivated in the Bengal provinces, we do not think it necessary to recapitulate; for, however satisfactory so far as they go, they are yet comparatively in their infancy, and on too small a scale to admit of any thing beyond prospective conclusions being deduced from them, and can only be looked upon as experiments in progress, but not sufficiently advanced to afford sure data from which to reason, and therefore not fit to be opposed to the experience of Dr. Lush, as given in his succeeding papers.

Mr. Bell concludes his paper with the following comment on Dr. Lush's statement, that the cotton imported (from the interior ?) into Bombay, has increased within a few years from the annual value of eighty or ninety lakhs to nearly three crores—" I am at a loss to know from what source Dr. Lush has derived his information, but if the *Bombay Courier* of the 10th May 1836, gives correct views of the cotton trade, the exports of this article for six years ending 1835 inclusive, to China and Great Britain, afford an average 195,118 bales, and, supposing them to contain 300-lbs. each, and estimating the cotton at eight rupees per maund, would give an annual export of something more than fifty-three and a half lakhs in value. How the dealer disposes of the difference, say two crores, I am at a loss to understand. The external commerce of Bengal has not, for many years, been so brisk as it is at this moment, but Bombay will beat us hollow if she takes such fast strides with other products as Dr. Lush has given her credit for in the article cotton."

The extracts we have made from this paper are sufficient to show the style of the author, and the preceding abstract the train of argument he employs. We acknowledge the difficulty of abridging Mr. Bell's writing, but the space we have devoted to his paper, will, we trust, satisfy him, if we have failed in doing him justice, that it is from no want of inclination on our part. To this paper Dr. Lush has published a reply, a portion of which we shall quote, partly with a view of exhibiting a specimen of his style, on which we propose by and by to make some observations, but still more to show how he has evaded the strongest argument brought against him, and which, if inconclusive, ought to have been the easiest answered; thereby leaving the impression on the mind that Mr. Bell has equally the advantage throughout. " I have received Mr. Bell's paper, which is instructive and amusing; of course most of the remarks are answered in those portions of my paper which have been published since he began his commentaries." " It is rather desultory work replying to remarks on a paper, when you are uncertain how much of it has been read, but still very certain that part, that has been read, has not been understood—however, I cannot but feel flattered at the notice taken of my remarks, and hope it will

appear not the least satisfactory point having frightened Mr. Bell. I must take the liberty of beginning at the end of Mr. Bell's paper, and proceeding upward; by this method we discover the source of Mr. Bell's alarm, namely, the great and increasing prosperity of Bombay. Mr. Bell may be assured that I have very good authority for estimating the trade in cotton at very nearly three crores. He says 'the external commerce of Bengal has not for many years been so brisk as at this moment, but Bombay will beat us hollow *(hinc illæ lachrymæ!)* if she takes such vast strides, &c. &c.'"

Here we put it to our readers, to Dr. Lush himself, now that the irritation under which he penned that passage has subsided, to say whether he would be satisfied with such an answer from another, or if that is meeting the question fairly. The accuracy of a statement of his, presumed to rest on official returns, is called in question, on the faith of the correctness of official authorities, open to all, which seems incontestably to prove that his statement is a greatly exaggerated one; and how is the objection met? not by producing his authority, but by telling his readers that Mr. Bell may be assured his statement rests on good authority! This may be satisfactory to him, but not to us; the more so, when we find that, at the rate of sixty-two and a half rupees per candy of 500-lbs., it amounts to the enormous quantity of 240 millions of pounds; or more, by a million, than the estimated produce of the whole of India, and more than half (nearly six-ninths) the produce of the United States.

We trust Dr. Lush will not accuse us of envying the prosperity of Bombay, for we can assure him that none can more heartily rejoice in her success than we shall, when he makes good his assertion, by the production of adequate authority; but, until he does so, we must be excused for withholding our belief in its accuracy, and adding that we think he has weakened all the other statements adduced in reply to Mr. Bell's objections, by shirking the only one which, if his authority be such as he alleges, could have been answered to the satisfaction of all parties, by their immediate production. Having thus far followed Dr. Lush in beginning with the end of Mr. Bell's paper, partly we confess, with a view to show how much he has lost the vantage ground on which Mr. Bell's premature attack placed him, by descending from the elevated tone of scientific discussion to the dogmatizing one of his antagonist; a departure from decorum which can only be excused by allowing for the feeling of injustice done him, under which the reply is dictated; we shall now return to the beginning, and notice a few only of the leading points of difference between them.

After a careful perusal of the whole series of Dr. Lush's papers, it appears to us that their sole object is to prove that labour and care

bestowed, whether by individuals or government, to introduce better kinds of cotton from abroad, is ill spent, because, owing to a late rise in price, the common dirty bazar cotton now brings in the English market nearly as high a price as the Upland American does, and a more remunerating price to the grower and merchant than the finer and cleaner sorts, whether indigenous or imported; and, lastly, that, generally, it is an absolute loss to cultivate the introduced varieties, first, as being all derived from one species, they are exceedingly apt to degenerate when brought among us ; and, secondly, because, being exotics, their culture is so much more expensive than the indigenous ones, that, even where they succeed best, they never repay the extra cost and care required in their culture.

The answer to the first of these propositions, namely, the late rise of price of even inferior cotton, is plain and strongly urged by Mr. Bell, namely, that it originates in excessive demand, arising from the very unexpected and unforeseen circumstance of America being unable to supply good clean cotton, equal to the demands of the English consumption ; and, therefore, to keep their machinery at work, the English manufacturers manage to work with dirty bad cotton, but will, as a matter of course, save themselves the trouble by rejecting bad Indian, so soon as they can get sufficient supplies of good clean American: it is, therefore, we think, a most dangerous argument to urge, that, because Indian cottons at 5*d.* per pound will give an ample profit to the growers, therefore we have no reason to fear " what some please to term competition with America," for even a moderate check to consumption, with an overstocked market, produces a depression out of all proportion to the check ; so that a few millions pounds extra of American cotton, thrown suddenly on the English market, might be productive of the greatest loss and inconvenience to the Indian growers and merchants, how much more so if the supply could be rendered permanently equal to the demand. The way to prevent such accidents is to raise, by care and attention in their culture, our Indian staples to an equality in all respects with the American. That such may, nay, that such will, be produced, we feel quite certain, if not in Bombay, the soil and climate of which seems peculiarly averse to the introduction of foreign sorts, at least in other parts of India. In many parts of Bengal the most promising results are expected, and among us there is not the least difficulty in introducing any kind; our soils and climate seem peculiarly suited to the Bourbon and American cottons, and, so soon as the old prejudices in favour of black cotton soils, to the exclusion of all others for its cultivation, are removed, we may, we think, fairly calculate on rivalling American varieties, the produce of America herself, while our indigenous sorts, raised from similar soils, are often barely worth the trouble of gathering.

Nothing, therefore, it appears to us, could have been more injudicious on the part of Dr. Lush, considering the situation he holds, and the respect which naturally attaches to his opinions, than their publication; without distinctly and unequivocally, at the very outset, limiting them to the tract of country with which he is acquainted. Again, admitting, as we do, the limitation of the genus *Gossypium* to two or three species, and the marked tendency it exhibits to run into varieties, we would deduce the very opposite conclusion, that, namely, which Mr. Bell has drawn, that this very tendency gives us reason to hope for success, which a plant of a more steadfast kind would altogether forbid, and it certainly seems strange to us, that Dr. Lush has not made more use of his opportunities, to procure varieties suitable to the country he occupies, than his paper seems to indicate. To the fact stated, that the quantity and colour of the fur adhering to the seeds is apt to change, we are inclined to attach considerable importance, when viewed in connexion with changes of staple, and think it a subject worthy of more attention than has yet been bestowed on it, and hope that those who have opportunities will not neglect to bestow the attention it merits. To the question of Mr. Bell, "why does not Dr. Lush mention on what experimental farm he observed the conversion of green-seeded American into black-seeded cotton, and his authority for assuming that the black-seeded cotton was in reality produced from green-seeded American?"—we would answer, objecting in the first place to the style in which it is couched, that we think Dr. Lush has supplied most sufficient authority for his statement, when he says *I saw it.*

We must now hasten to a conclusion, the importance of the subject having already induced us greatly to exceed our limits. To Mr. Bell we acknowledge our obligations for calling general attention to a subject, in a national point of view of such vast magnitude, and which, under the weight of an authority generally considered even on this side of India unquestionable, might have suffered serious injury from the publication of Dr. Lush's memoir; but, while we thus approve of the motive, we cannot equally commend the style, which all along impressed us with the idea, that Mr. Bell wrote under feelings akin to personal altercation, in place of those more calm and elevated ones, which belong to the philosophical investigation of a great national question. Much indeed do we regret this departure from the decorum which usually does and always ought to obtain in scientific discussion, where individual interests are not at stake, and the simple elicitation of truth is the object aimed at, because we know the "snappish dogmatical and overbearing style" of his remarks has tended to diminish the

force of his arguments, and to deprive them of much of the effect they were otherwise calculated to produce. On such an occasion the purity of Dr. Lush's motives ought to have been respected, as much as he (Mr. B.) wished his own to be. Dr. Lush was aware that many fruitless and expensive attempts had been made to introduce exotic cottons into Bombay, and he had made many himself; anxious at length to discourage such unprofitable labour, he drew up and published his memoir, neither the arrangement nor style of which are, in our opinion, we confess, the best suited to make the desired impression; and he has, we think, besides erred in generalizing too much: but, in spite of these defects, we do not see that Mr. Bell is justified in accusing him of a wish to repress inquiry, of forming baseless, new fledged theories, of building hobby horses on which he wishes all men to ride as well as himself, for that is the meaning of the passage, though somewhat differently expressed. Dr. Lush has merely detailed the result of his own experience, as any other man would do, and left others to choose for themselves. What else does Mr. Bell do, with this difference in favour of Dr. Lush, that he draws his conclusions mainly from his own experience, in place of from that of others. That Dr. Lush has established his case with respect to India generally, which by the way he does profess to do, we are far from thinking; and even doubt whether his views will ultimately be found to hold good for the tract of country to which they more immediately refer: but, not wishing to fall into the error which we complain of in him—excessive generalization—we presume not to offer any opinion on a country, with the nature of whose climate and capabilities we are personally unacquainted.

We would, however, entreat Dr. Lush to continue his experiments, and furnish somewhat fuller details of the sources of failure, the better to enable us to guard against them, as well as those circumstances which we may expect to operate in our favour, and which, skilfully taken advantage of, may finally ensure success. The characters of the soils, especially with reference to their retentiveness of moisture, as well as their usual state of dryness, or the contrary; their depth, and the qualities of the sub-soil, and whether wet or dry; the nature of the climate, especially with reference to the frequency of rain, and the usual length of the intervals of dry weather; and whether the American varieties were tried on soils apt to crack and yawn during seasons of drought.

In Coromandel, a few trials were sufficient to satisfy experimenters, that the black soils were altogether unsuitable for either the Bourbon or American varieties. For the former the red loamy soils of the interior, that never crack, have been found most suitable, but it thrives

equally well on the gray loamy soils of the coast. The American kinds have been found to thrive in similar soils, but the staple is inferior; it answers well on alluvial soils adapted to the cultivation of rice, but does not require irrigation. It has not we believe been sufficiently tried on sandy saline coast soils, but may be expected to succeed well when tried. The success which has attended trials in such situations, the equal facility of culture with the original country cotton, and the great additional value of the product, bid fair to ensure a rapid spread of this kind of cultivation. Have similar soils been tried on the Malabar coast, and been found equally unsuitable there with the black ones? On this side of the ghauts we believe we may with safety state that irrigation is never employed, unless perhaps occasionally when disappointed of the usual supplies of rain immediately after the sowing season, and before the young plants have acquired substance enough to resist the protracted drought; but, generally, the lands employed are so situated as to preclude the possibility of watering.

Dr. Lush estimates the cost of cultivating perennial cotton at from twenty-five to thirty per cent. more than the annual kinds. It is desirable to know how he arrives at this conclusion, since, on this side of India, the perennial system is usually preferred, as the cheaper mode of cultivation, owing to the great saving of labour and seed which is thereby effected, and still more from the larger crops reaped in the second and third years than the first. Has it been sufficiently tried in Malabar, especially with reference to those sources of profit?

These are a few of many points which still remain to be inquired into, and on which we should wish Dr. Lush to favour us with the results of his experience; and should he think this periodical a suitable channel for making them known, the Society, we feel sure, will gladly receive them. We make this request with a view to elicit information, and therefore trust that all particulars relating to experiments may be as detailed as possible—general results, unaccompanied by a full exposition of the steps by which they were arrived at, we consider insufficient; for the soil, climate, and other contingencies affecting the result of experiments undertaken in Coromandel, in imitation of those made in Malabar, are so different, that unless they can be modified, according to some fixed principle, they may lead to most opposite conclusions.

Tobacco.—The next most important series of papers on commercial agriculture are those on tobacco, but these will not detain us long, as two principal ones have been already re-published in our Journal—that, namely, of Mr. Piddington on soils, and of Mr. Royle on the cultivation of tobacco in India. The others consist of a report on tobacco

produced from Virginia seed at the Society's late farm of Akra. The report is drawn up by dealers and manufacturers of London, who declare the sample in question the best "Indian tobacco they had ever seen," and consider it worth from 6*d.* to 8*d.* per pound.

Madras, we believe, now supplies the English market with tobacco to the extent of about one thousand chests annually, the whole of which sells in bond at these prices. This is excellent encouragement, as we believe the average price of real Virginian tobacco does not exceed that amount, and we have been informed, unless we mistake, that it is placed in the bond warehouse at about 2*d.* per pound, thus affording an average profit of nearly 200 per cent.

Mr. Piddington gives an account of some very good tobacco which he raised on an ordinary dark gray or black soil, and which he, so to speak, manured with iron by putting a handful of "Soorky," (what form of the metal that is we are unable to inform our readers) into each hole when transplanting. The experiment of course must go for nothing, as the circumstances in which it was made were unfavourable, and no comparative trial was made to ascertain the effect of the iron by planting so many more without, and then treating them in all other respects the same.

Some Cabool seed, which was sown in Salem, and treated in the same manner as the Virginia is in that district, produced a fair crop of rich fine tobacco, in spite of the season proving somewhat unfavourable, and the plants being slightly attacked with mildew. We shall probably return to this subject. We cannot close our notice of this volume, so replete with information, without expressing a hope that we may annually have an opportunity of passing in review, and bestowing on each occasion our humble meed of applause, at least a similar volume of Transaction of the Agricultural and Horticultural Society of India.

R. W.

XV.—Selections.

Historical Sketch of the Kingdom of Pándya, Southern Peninsula of India, by Horace Hayman Wilson, Esq. *Boden Professor of Sanskrit, Oxford.*

The following sketch of the history of the principality of Pandya, one of the earliest political divisions of southern India, was compiled several years ago, from documents contained in the manuscript collections of the late Colonel Mackenzie. It was prepared before the completion and publication of my catalogue of those collections, and it was my intention to have revised it at some future period, with the assistance of such further materials as a more thorough examination of its authorities might have supplied. At the same time, I commenced similar epitomes of the history of the other chief states of the Peninsula, purposing in like manner to give them the benefit of future revision and comparison with additional sources of information. Time, however, passes away, and I have not had any opportunity of carrying my intentions into execution. When such an occasion may offer is still uncertain, and I have thought, therefore, that it may not be unacceptable to the Royal Asiatic Society to be put at once in possession of what I have effected, at least as far as relates to the kingdom of Pandya. From my subsequent investigation of the Mackenzie Collection, I do not expect that any material accession to our knowledge of the remote condition of the Pandya kingdom will be derived from it; but, at any rate, so much as is here supplied will, in the mean time, contribute to throw some light upon a dark period of Pandya history, and may pave the way for its more complete and more successful elucidation.*

The historical traditions of the south of India divide the extreme southern portion of the east part of the peninsula, which is termed Drávira Désa, into three principalities, or those of Pandya, Chola, and Chéra. The first of these is the subject of the present inquiry. The early existence of the Pandya kingdom we learn from classical authorities.† At the beginning of the Christian era, the Regio Pan-

* A list of the authorities will be found at the end of this paper.

† The author of the *Periplus of the Erythrean Sea*, particularises Nelcynda, or Neliceram; Paralia, Malabar, or Travancore; and Comari, Cape Comorin; as ὑπὸ τὸν βασιλέα Πανδίονα, under king Pandion. Dr. Vincent conjectures, that the king of Madura had extended his power from the eastern to the western side of the peninsula, and was master of Malabar when the fleets from India first visited the coast (vol. ii. 401). He also thinks it likely that the power of Pandion had been superseded in Malabar between the age of the Periplus and Ptolemy; for Ptolemy reckons Aii next to Limurike on the south, and takes no notice of Pandion till he is past Cape Comorin (ibid). The conjecture derives very strong support from the traditions of these countries. It may be supposed that the embassies sent by Pandion to Augustus, as noticed by classical

dionis, of which Madura was then and ever afterwards the capital, appears to have comprehended the greater part of the southern portion of the Coromandel coast, and to have extended across the peninsula to Canara and Malabar, and southward to the sea. It was subsequently confined to narrower limits by the independence of Malabar and the rise of the state of Chéra to the west, by the growth of the principality of Ramnad to the south, and the aggrandisement of the Chola sovereignty to the east, till it sank, in modern times, into the petty government of the Náyaks of Madura. At various periods of its history it may be presumed, the following definitions of its limits have been laid down by native authorities. One account places Ramé-swara on the east, Kanya Kumári on the south, Satyamangalam on the west, and the river Palar on the north. Another, which seems the more accurate, makes the Valar river the northern boundary, and Paruvali the western; but agrees with the preceding in carrying the Pandya territory to the sea, both to the south and east, including, consequently, the present Ramnad, and part of Tinivelly.

The Coromandel provinces on the eastern peninsula, from the Godaveri to Cape Comorin, are described in all the traditionary accounts of this part of India, as one vast tract of forest to which the name Dandaka, or Dandakàranya was applied. It was in these thickets that Ráma and Sitá resided during their exile, that he commenced his warfare against the Rákshasas, or savages and fiends, who divided with hermits and sages the possession of the wilderness, and that Sitá was carried off in resentment of Ráma's successful attacks upon the wild tenants of these shades. After the subjugation of the savage inhabitants of Dandakáranya and the conquest of Lanká, various individuals from the north, it is said, attracted southwards by the performance of pilgrimage to the scenes of Rama's triumphs, were tempted, by the unoccupied state of the country, to settle themselves and their families upon the undisputed territory. They accordingly cleared and cultivated different tracts, and thus laid the foundation of future principalities. To such circumstances the Pandya kingdom owed its rise. An adventurer, named Pandya, of the Velálar, or agricultural tribe, first established himself in that portion of the south to which his

authorities, and which there is no reason to call in question, arose out of the ambitious extension of the territories of the Pandya prince: two occurrences of this nature are noticed, one the 18th year after the death of Julius Cæsar, which reached Augustus at Tarracona; the other six years afterwards, when that prince was at Samos. Et quidem duplex erat illa ad Augustum legatio, cujus utriusque tempus habemus exploratum; prior bello Cantabrico quam Tarracone Augustus accepit, teste Orosio (vi. 21). Secundam deinde legationem anno Varr. 734, assignat Dio (l. liv.), quo tempore Sami hyemavit Augustus. Hos vidit, ni fallor, legatos, Nicolaus Damascenus, Antiochiæ Samum, ut videtur, petentes, teste Strabone (l. xv. p. 719). DODWELL, de Ætate et Auctore Peripli Maris Erythrei, 105.

name was afterwards assigned.* This happened, according to the authority followed, in the last *yuga*, or *age*, in which seventy-two princes are enumerated as ruling over the kingdom. Other accounts, however, do not name the founder of the monarchy, but pass over some indefinite interval to the reign of Sámpanna Pandya, whose son, Kùla Sèk'hara is, in all the lists, specified as the first king of Madura, from his being regarded traditionally as the founder of that city. It is from this prince that seventy-two kings are enumerated in the list above referred to.† Another list,‡ said to be taken from the *Madura Purâna*, but, if so, not very accurately compiled, reckons seventy-five princes from Soma Sundara, the third of the preceding list, to Kuna Pandya, who appears to be its seventy-third. Another list limits the number of kings from Kula Sék'hara to Kuna Pandya to thirty,§ whilst it is stated generally, in a different authority, that the whole number of Pandya kings who preceded Kuna Pandya, amounted to three hundred and fifty-seven :|| it is evident, therefore, that beyond mere names, and those, perhaps, more fanciful than historical, we are not likely to derive much satisfactory information from these conflicting statements. It may, indeed, be observed of such lists,¶ and they are numerous, that they bear their own refutation when they assert very high antiquity. The names are from the first Sanskrit; but, according to the most able scholars in the languages of the Dekhin, there was a period which preceded the infusion of Sanskrit** into the dialects of the south, and the princes of those periods were, of course, not designated by exotic appellations. Either, therefore, the first names of the lists are modern fabrications, or the lists ascend to a comparatively recent date. There can be no doubt, that in examining local lists of Hindù kings in the peninsula, both sources of error, or misrepresentation, are to be taken into account.

The objection advanced against these lists applies equally to all the

* No notice of any of the kingdoms of the south could consistently occur in the Ramayana. Manu speaks of the Dráviras as degraded Kshetriyas, but makes no mention of Cholas or Pandyas. Both Chola and Pandya are respectively mentioned in the Maháb-hárata, but their origin is not there described. The Harivansa and Agni Purána, make Pandya, Chola, Kerala, and Kola, great-grandsons of Dushyanta, of the line of Puru, and founders of the regal dynasties named after them. The descendants of Dushyanta, however, as specified in the Vishnu Purána, do not include these personages, and their insertion seems to have been the work of the more recent authorities. The Harivansa, with no little inconsistency, places the Pandyas and Cholas amongst the Kshetriya tribes degraded by Sagara. The Padma Purána has a similar addition to the list of those tribes in the Rámáyana.

† List of authorities, No. 1. ‡ List, No. 3. § List, No. 2.

|| Rájá Cheritĭ. List, No. 5.

¶ Besides those comprised in the Mackenzie Collection, Buchanan has published several. (Travels in Mysore). Some of his and those of this collection are the same, having been procured at the same places.

** Ellis and Campbell. Introduction to Campbell's Telugu Grammar.

written records, and is alike fatal to the extreme antiquity of the events which they narrate. The meagreness and inconsistency of the various sources of information might throw a suspicion upon the existence of the Pandya monarchy at any remote period, did not classical writers bear testimony to the celebrity even of its capital city, at the very commencement of our era. How long before this it was founded we have scarcely any means of conjecturing, but the traditional history of the Chola dynasty records the disappearance of that race, as independent princes, to have occurred in consequence of the marriage of a Chola princess with Vara-guna Pandyan, whom it calls the forty-eighth Pandya king. In our lists, however, he appears to have been the twenty-second or twenty-ninth, and supposing the union of the Chola and Pandya sovereignties to have been thus effected before the reign of Augustus, and the number of preceding reigns not very erroneous, we may conjecture the appearance of the Pandya principality as an organised state, and the foundation of Madura to have happened, about five or six centuries anterior to the Christian era.* Of the events that have befallen the kingdom during the long period that has since elapsed, very few are attributed to remote times, and of them the authenticity may be doubted. Such as they are found, however, in the only records that remain we shall proceed to detail them, omitting the most extravagant fictions, and curtailing the most tedious of those which we select.†

* It is not improbable that some centuries preceded the foundation of Madura, during which the first settlers were occupied in clearing the ground and erecting habitations, and forming themselves into organized states. According to the Purânas, as estimated by Hamilton, ten centuries were thus occupied; but this seems to be more than requisite, and perhaps five would be nearer the truth, placing the first establishments in the south about one thousand years before our era.

† The authority followed in the first part of the ensuing detail is called a translation of the *Madura Purâna* (List of Authorities, No. 7); it appears to be a translation of the Tamil work called *Tiruvalaiyâdal*, which is also designated sometimes as the *Madura Purâna.* This is the work of Parunjoti Tamburan, a Pandaram, or Saiva priest, who is said to have written it in the reign of Hari Víra Pandyan, in the Salivahan year 973 (A. D. 1051). It relates the sixty-four miracles or frolics of Sundaréswara, the tutelary divinity of Madura; and is, in fact, but a translation or paraphrase in Tamil of a Sanskrit local legend, entitled *Hálásya,* said to be a section of the *Skanda Purâna,* a source always assigned in the Dekhin to detached local compositions, to which the composers wish to affix the authority of Pauranic sanctity. The Skanda Purâna being a Saiva Purâna, is the ready resource of that sect, and is made the parent of a much more numerous offspring than legitimately belong to it. The *Hálásya* is of this description; but if the date of its Tamil representative be correctly given, it is of use in fixing that of Kuna Pandya, with whose reign it closes. The collection contains two MSS. professing to be translations of the *Madura Purâna:* they do not exactly agree, however; and one is much more brief than the other, whence it is possibly the translation of an abridged work, the abridgment not adhering, with inviolable fidelity, to its original, as is usually the case amongst Hindu writers. The MSS. are Nos. 7 and 8 of the List of Authorities. The account of the work and its author, is from a MS. list of Tamil authors, and the catalogue of Tamil books. Another MS., No. 11, which has been also

According to the *Madura Purána*, the residence of the Pandya kings was for many ages at a place called Kurk'hi, not improbably the Kolkhi of the Periplus, a city subject to the Pandya king, as the author observes, and, perhaps, as D'Anville notices,* still to be traced in the appellation Kilkhar, or Kilakarai,† on the Coromandel coast, opposite to Ráméswaram. One of the Pandya monarchs, named Sámpanna Pandya, invited the Chola and Chéra princes to the wedding of his son. On their way to Kurkhi they were caught by violent rains, and compelled, by the flooded state of the country, to remain encamped on one spot for a month, in memory of which event the Pandya king built a city there, naming it Kalyána-pur, which was for some time the capital of his son and successor, Kula Sék'hara.

Kula Sék'hara, in the commencement of his reign, built a new city about two leagues to the north of Cape Kumari, which he named after himself, Kula Sék'hara Pattan: he resided, however, at Kalyána-púr. It happened that a merchant returning from a journey to Malayálam, or Malabar, lost his way in the forests of Chandragiri, the hilly district west of Madura, and its vicinity. Whilst exploring his track alone he discovered an ancient temple, dedicated to Siva, as the Mula Linga, or Choka Náyaka, and Durga, as Minákshi Amman. The temple had been erected by Indra when performing penance in the Dandaka forest, for the expiation of the sin of murdering Vritrásura, who, although a demon, was a Brahman. The merchant, himself a devout worshipper of Siva, paid his homage to the deity, and was, in consequence, favoured with a personal communication, directing him to announce the discovery to the Raja, and the will of the god, that a city should be founded on the spot. The same injunction was conveyed in a vision to the prince, and the concurrence of these intimations established their divine origin. Kula Sék'hara accordingly repaired to the place, cleared the forest, rebuilt the temple with great architectural magnificence,

consulted, is entitled a translation of the Pandya Rájákal; the original of this is a Tamil prose work, sometimes attributed to the three most eminent of the first professors of the Madura college Narakira, Bána, and Kapila. The accuracy of this notion may be questioned, as it rests solely upon the work closing with the reign of Vamsa Churámani, under whom these writers are said to have flourished; and it is contradicted by the tenor of the last sentence, which speaks of the literary institutes first promulgated by, or exemplified by these teachers having been communicated to their disciples, and thus handed down through consecutive generations. The work itself agrees closely with the *Madura Purána*, and is, therefore, probably, as well as it, a branch from the same Sanskrit stem, the *Hálásya Máhát'mya*, which work is also in the collection, and has been compared with the translations.—Mackenzie Collection, I. p. 91, cxxi.

* D'Anville Antiquité Geographique, 122. Also Vincent's Periplus, ii. 443: the general identity is beyond question by its being then, as now, the scene of the pearl fishing.

† See Journal Royal Asiatic Society, No. V. p. 169.

constructed a splendid palace for the royal residence, and founded an extensive and stately city. The gods beheld the progress of his labours with interest, and, on their completion, a shower of nectareal dew descended from heaven, spreading a sweet film upon the ground, which gave the appellation Madhura (sweet) to the new city. The stately monuments, of which the vestiges are still to be seen in Madura, are the work of much more modern times ; but the classical authorities already referred to, establish, for that city, an existence of venerable duration. The gradual transfer of the Pandya capital from a southerly to a more northerly site, is in harmony with the tradition of the country being first cleared and cultivated by pilgrims to Ráméswaram. It may be here observed, that the prevailing form of the Hindú religion in the south of the peninsula was, at the commencement of the Christian era, and sometime before it, most probably that of Siva, as, besides the positive testimony of these legends, the name of the cape, Komári, or Kumári, the virgin, is, as a mythological appellative, restricted to Durgá; and that it was in this place a mythological name is proved by the author of the *Periplus*,* who states, that persons purposing to lead a religious and widowed life bathe at Comar, because, as the history relates, a goddess formerly used to perform her ablutions monthly at this spot.

The second Pandya prince is named Malaya Dhwaja, of whom his extreme devotion to the tutelary divinities of his capital is the only peculiarity recorded.† In return for his attachment, the goddess Minák-

* *'Απὸ δὲ ταύτης ἐστὶν ἕτερος τόπος τὸ Κομὰρ λεγόμενον. ἐν ῷ τόπῳ φρούρια ἐστὶν, και λιμήν. ἐις ὃν οἱ βουλόμενοι τὸν μέλλοντα αὐτοῖς χρονον ἱεροὶ γενέσθαι, χῆροι μένουσιν ἀυτοῦ, ἐκεῖ ερχόμενοι ἀπολούονται, τὸ δ'αὐτὸ καὶ γυναῖκες. ἱστορεῖται γὰρ τὴν θεὸν ἐκεῖ ἐπὶ μῆνας κατά τινα χρόνον ἐκεῖ ἀπολελοῦσθαι.*

Paolino says, the convent and the custom still existed in his time.—Vincent Periplus, ii. 443. See, also, Viaggio Di Fra Bartolomeo.

† The traditions of the south, however, make him a more important character, and consider him as the father of Chitrángadá, the wife of Arjuna. This opinion is grounded on a section of the Sabhá Parvan of the Mahábhárat, where Sahadeva, whilst performing his military career in the Dekhin, is described as having an interview with his father-in-law Malaya Dhwaja, king of Pandya. This section, however, is perhaps peculiar to the copies of the Mahábhárat, current in the peninsula, as it has no place in a fine copy in Devanagari character, in my possession. In the first chapter, too, it is there said that the father of Chitrángadá is Chitraváhana, king of Manipur, to which Arjuna comes on leaving Kalinga. The Telugu translation of the Adi Parvan agrees in the names of the parties, but places Manipur south of the Kávéri. How far, therefore, it is safe to identify Malaya Dhwaja with Chitravahána, and Manipur with Madhura, must depend upon the verification of the authenticity of different copies of the Mahábhárat. The result of a careful collation of seven copies at Benares, examined at my request by Captain Fell, may be regarded as fatal to the identification, not one of them containing the section in question, or the name of Malaya Dhwaja. The Bhágavat calls the bride of Arjuna, Ulupi, the daughter of the serpent king of Manipura.

shi herself became incarnate as the daughter and the successor of this prince.

Múmulai Tadátaki, the new queen of Madura, was a warlike princess. She subdued, it is said, the whole of the peninsula, and carried her arms over northern Hindustan to the Kailása mountains. Here her victorious career terminated in an event more glorious than her preceding triumphs. She was opposed by no less a person than the god Siva, by whom she was defeated and taken a prisoner. It was now her turn to vanquish: the god became enamoured of her charms and allowed her to return in liberty to Madura, whither he followed her and obtained her hand.* Having assumed a human form of great beauty, the god was known by the title Sundara (the handsome) Pandyan; and although it does not appear how he attained the privilege of giving a cognomen to the emblem of himself, worshipped in Madura, yet the Múla Linga is most commonly known by the name of Sundaréswara, the god of Sundara, which it shares with that of Choka Náyaka.

That this tradition is not wholly without foundation is established by several circumstances, if we look to its implied rather than to its literal import. It is not improbable that the worship of Siva was introduced into the peninsula from northern Hindustan some few centuries before the Christian era, and that, in the reign of one of the early princes of Madura, it was established in that city. The tradition which peoples the peninsula from the north of India, and the existence of the Saiva faith there, coeval with the era of Christianity, are fully in harmony with the account given of Sundara Pandyan. In further confirmation of the native country whence the Tamil faith was derived, it may be observed that Sanskrit, which, in Drávira Désa, as in every other Hindu country, is the language of religion, is always called by Tamil writers Vádá Mozhi,† the northern speech, and, finally, the learned writer from whom the remark is taken, observes, that the literature and religion of the Brahmans were brought by them into the peninsula from northern Hindustan.‡ Whether this occurred at so early a period as the one now under discussion may be doubted, although some of the circumstances we have adverted to are in favour of the supposition. That there are, on the other hand, reasonable bounds to its antiquity cannot be disputed; for, besides the inference derivable from the traditions relative to the colonisation of the peninsula, we

* The legend relates, that the princess was born with three breasts; the centre one was to disappear when she met with a suitable spouse, and, accordingly, vanished upon her encountering Sundaréswara. Images of the goddess, with three breasts, are still seen amongst the sculptures at Madura.

† ELLIS's Dissertation on Malayalam, p. 3, note.

‡ Ibid, p. 26.

have the testimony of Menu,* that the Draviras were classed with the impure, or outcast tribes, when those institutes were compiled; and, even in the Mahábhárat, the people of the southern countries appear to be considered as scarcely Hindus.

Sundara and Minákshi, after a reign of some thousands of years, resumed their celestial characters, and returned to heaven. They were succeeded by their son, Wugra Pandyan, who, as the offspring of Siva and Déví, was, of course, an incarnation of Kártikéya. Eastward of Madura is the mountain Tirŭparumkunru,† whence fell a stream, named Sarovara Vaikál. Agreeably to the system of local adaptation which seems to have especially prevailed in the Dekhin, and which transferred the names of sacred places in the north of India to others in the south, this mountain became another Kailása, and the stream, another Ganges. The scene and chief actors being thus identified, we are not to be surprised that the birth of Wugra should have been here attended with the circumstances narrated by the Purànas of the birth of Skanda, or Kártikéya, and that this site acquired the honours of a Tirt'ha, or place of pilgrimage, under the presidence of Subrahmanya,‡ another name of Kártekéya, who was, from a remote date, a favourite deity with the nations of the peninsula.

Wugra Pandyan, being of such exalted origin, was engaged in conflicts proportioned to his rank, and, after subduing the kings of earth, waged war against the king of heaven. Indra, being discomfited by him, was compelled to grant the showers which he had forborne to shed upon the Pandya kingdom. Wugra was married to Kántimati, the daughter of the Chola king, and by her he had Víra Pandyan, who succeeded him.¶

* Book x. 5.

† The most famous place under this appellation, Subrahmanya Kshetram, or Tirt'ha, is in the province of Canara. A hill to the south of Madura, denominated, from ideas connected with this superstition, Skanda Malai, the Mount of Skanda, another name of Kártikeya, or Subrahmanya, has suffered a very curious change, Skanda Malai being converted into Sicander Malai, the hill of Secander, or Alexander. Les naturels croient que le médecin ordinaire d'Alexander le Grand y a été enterré. LANGLES, ii. 11. A native account says it is the tomb of Alexander himself; an idea, no doubt, introduced by the Mohammadan Fakirs, of whom many reside on this hill, and attach a profitable sanctity to the small tomb, once a temple of Skanda, now the shrine of Secander. To the Hindus it is equally sacred, as it is said to contain in one of its caves an image of Skanda, which they go to worship.

‡ This appears, however, from some accounts, to be the same as Skanda Malai (MS. No. 80), which is three or four miles south-east of Madura.

¶ One account, the Raja Cheritra, vol. vi., makes great confusion with this prince and his predecessors. It calls him Alaka, and makes him the father of Minakshi, married to Chokanath, and of Alyarasani, married to Arjuna. At the same time he is described as the son of Malaya Dhwaja, and grandson of Sundara, an order of descent very different from all the other authorities.

Víra Pandyan was killed, whilst hunting, by a tiger : he left many sons by the women of his household, and one, the youngest, by his queen, whom the ministers placed under the tutelage of the Chola monarch, to secure him from the treachery of his elder brothers. When old enough he was conducted to Madura, and installed ; upon which, his brothers fled to Chera ; they do not seem to have given him any subsequent molestation. This prince was named Abhishéka Pandyan ; he was succeeded by Vikrama, of whom no traditions are given ; and he by Raja Sek'hara,* in the time of which latter, it is said, the Chola prince led an army of Samánals, or Buddhists, against Madura. He was defeated ; but no consequences of his repulse are recorded. The next sovereign of Pandya-desa is named Kulottunga, in whose reign we have abundant legends illustrative of the might of Choka Nátha, but nothing that can be conjectured into history. He was succeeded by his son, Anantaguna, in whose reign the kingdom was again invaded by the Samanal; but, with the aid of Siva, the assailants were repulsed. On this, as on the former occasion, the heretical invaders are conducted by the Chola monarch, whose seat of empire is called Kánchí, or Conjeveram. That the territories of the Chola prince lay higher north than the modern Tanjore there is probable evidence in other manuscripts, as, also, that Conjeveram was included within his dominions. That it was the ancient capital of Chola is, however, quite irreconcilable with all the local accounts which have been procured of that empire, and the foundation of Kánchí itself appears from them to be an event of comparatively recent occurrence. The same accounts, however corroborated by the vestiges of Bauddha architecture, found still abundantly at Conjeveram, attest the prevalence of that faith there for some considerable period. This might have been the case at the time the legendary tales which profess to record the Pandya history were compiled; and hence, these supposed religious aggressions emanating from the Chola monarchs of Conjeveram. That frequent contests between the Chola and Pandya princes occurred in remote periods there is no reason to doubt; but it is not quite so certain that the particular occasions are specified with much accuracy, or that hostilities, embittered by religious differences, disturbed the tranquillity of the Dekhin some centuries before the Christian era.

Anantaguna was succeeded by his son, Kula Bhúshana, in whose reign, it is said, in the Pandya Rajakal, that the Pandya kingdom

* All the lists agree in inserting Vikrama's name. The translation of the *Tiruvaleyádal* omits him making Raja Sek'hara the son of Abhisheka.

was invaded by Kiráta Raja, sovereign of Chédí, but it can scarcely be supposed, that by this is intended the country usually identified with Chédi, or Chandail, in central Hindustan. The appellation, Kiráta, assigned to the Raja, indicates a mountaineer, the wild inhabitant of thickets and fastnesses, subsisting by plunder and the chase; and in the Tiruvaleyádal, the invader is designated with more consistency, as the Sétu Raya, the prince of Marawa, the district lying east of Madura along the sea-coast, and which would, therefore, appear to have been an independent principality in ancient as well as modern times. The minister, Sundara Sumantra, had been provided with funds to levy a force to oppose the invaders, but he appropriated the money to the worship of Sundarèswara, and the invaders had nearly reached Madura before any troops were collected to resist them. In this predicament the minister had recourse to the god, and a miraculous host, representing the contingents of the fifty-six kingdoms of India, was immediately created for the defence of the kingdom. Against such combatants no chance of success remained for the invaders, but Kiráta, or the Marawa Raja, was removed even without their aid. He was killed by a lion sent by Siva,* and, upon his death, his followers fled in confusion to their native haunts. The result of this invasion was, therefore, only an accession of honour and devotion to Sundarèswara and Minákshi Dèví.

In the reign of this prince another marvel is recorded, which merits notice only so far as it accords with the general traditions of the origin of Conjeveram. Kántára Kháta Chola is said to have cleared the woods which covered that part of the peninsula; built the city of Kánchí on the site; and erected the pavilion and temple of Ekámbarèswara and Kámákshi-Dèví, the forms in which Siva and Durgá were worshipped at that city until very recent periods. In recompense of this prince's devotion, Siva conferred upon him aerial locomotion with the speed of thought, and thus enabled him to transport himself every morning to Madura, to pay his homage at the supreme shrine of Sundaréswara—a rather indifferent compliment to his own tutelary divinity.

Kula Bhúshana left two sons, Rájendra and Rájasinha, of whom the first succeeded to the throne. The Chola prince of Kánchí, Kantára Kháta, or, as he is named in the Madura Purana, Kandavetti, proposed an alliance with Rájendra, by giving him his daughter in marriage, to which the Pandya prince assented, and sent his brother, Ràjàsinha, to conclude the negociation with the Chola prince. The ambassador, however, prevailed upon that monarch to wed his daughter

* The scene of this event is laid by the *Tiruvaleyádal*, in the forest Tirupûvanam, at a place dedicated to Siva, as Purána-lingam, ten miles south of Madura.

to him instead of his brother, and to co-operate with him in an attempt to drive Ràjendra from the throne. The confederate princes marched towards Madura for that purpose; but they were encountered by the Pandya king, defeated, and taken prisoners. Ràjàsinha was detained in confinement during the rest of his life, but the Chola monarch was released and dismissed with civility to his own dominions.

Saundarya Páda Sek'hara, the son of Rajendra, succeeded his father. Like his predecessors, he is said to have been engaged in hostilities with the Chola monarch: and, whatever we may think of the circumstantial details of these repeated conflicts, it seems not at all improbable that a struggle for supremacy in the peninsula did exist, at a remote date and for a long period, between these rival dynasties, which terminated in the temporary ascendency of the Pandya monarchs. On this occasion it is related, that the Pandya king was forced to fly before his invaders, but their prince was drowned in the pursuit of his defeated foes, and the kingdom of Madura was thus preserved from foreign subjugation. Of course, the accident was not a mere casualty, but was brought about by the seasonable interference of the tutelary deities of Madura. Saundarya Pàda died soon after his return to his capital, or, as it is said of every Pandya prince, he went into the *adytum*, or inner chamber, of the temple of Múla Linga, and was united to the god. If we do not suppose that this was a contrivance of the priests to get rid of those princes of whom they were tired, or with whom they were dissatisfied, we must conclude the ceremony to have been part of the religious institutes of the kingdom, and that the princes and persons of note were carried to the temple, to die in the presence of the tutelary gods, in the same spirit as that which, in Upper Hindústàn, conveys the expiring individual to breathe his last upon the banks of the Ganges.

Varaguna, the son of the last prince, succeeded. His reign contains the usual proportion of marvels; but nothing of a historical character in the authorities hitherto followed. This omission is the more remarkable, as the Chola records ascribe the disappearance of the series of their princes to the transfer of the kingdom to Varaguna, by his marriage with a Chola princess, as has been noticed above;* and the union of the two principalities under a common sovereign appears to have actually occurred about the period at which this prince may possibly have reigned. The fact is supported by another

* According to the *Chola Désa Púrvika Charitra Vyakhyanam*, Váraguna was the son of Balachandra Pandyan. His wife was the daughter of Kulottunga Chola. Their descendants occupied the united Pandya and Chola kingdoms, for twelve generations and five hundred and seventy years.

authority, however, and a cheritra, or history of Varaguna,* states his repulsion of an invasion by the Chola king, Karàvar Chola, his subsequent conquest of that kingdom, and its annexation to the Pandya monarchy. A celebrated poet, named Bàna, or Pana-patra, is said to have flourished in this prince's reign.

Vara Raja, or Raja Rajendra, succeeded Varaguna. In his reign a ridiculous legend is narrated, which so far merits recapitulation, that traces of it are frequent in the sculptures still visible at Madura.

At Kuruvaituri, west of Madura, a rich farmer had twelve sons, who spent their time in various sports, and especially in the chase. They one day attacked a wild hog and his family, killed some, and pursued the rest to the vicinity of a holy sage engaged in profound meditation. Having disturbed the abstraction of the sage, he cursed them, denouncing their future birth as hogs themselves. On their humiliation, however, and earnest prayers for forgiveness, he so far modified his imprecation as to make the temporary degradation the means of future honour and fame.

The twelve youths being reborn in their porcine capacity, lost their tender parents by the spears of Raja Rájendra and his fellow-sportsmen, whilst they were yet too young to provide for their own subsistence. Their pitiful state moved the compassion of Choka Náyaka and Minákshi Amman, who happened to be in the forest during the chase, and they determined to act as the parents of the porkers. Minákshi officiated as their nurse, in which character figures of her occur, and Choka Náyaka as their tutor. One effect of this divine protection was to humanise their bodies, so that they became men with the heads of pigs, in which combination their statues are sculptured.† Another consequence of their fortunate destiny was their deriving from their preceptor profound conversancy with arts, sciences, and letters, and their consequent advancement to the ministerial administration of the affairs of the Pandya kingdom.

The reign of Raja Rájendra is followed by an interval which is imperfectly filled up in most of the authorities by a mere string of names. The enumeration does not exactly agree in all cases; but in those which are the most authentic, it appears to extend to twenty-four or twenty-five princes. If we allow twenty years to a reign, and admit the accuracy of the enumeration, we should place the prince who succeeds these shadows in the second century of the Christian era: at the same time, as the data are altogether insufficient, it is obvious, that

* List, No. 13.

† They are described as occurring in Tirumalla Náyak's *Choltri*, by Mr. Blackader, Archæologia, vol. x 457; and his description is translated in Langles' Monumens de l'Hindoustan. Instead of ministers, however, Mr. Blackader calls them princes of the palace; and M. Langles converts them into *huissiers de la chambre*.

any conclusions advanced must be subjected to a considerable latitude, and that, consequently, the real date of Vamsa Sek'hara's accession cannot be determined with any degree of accuracy. It is quite sufficient to bring it within some moderate limits, and to place it not only upon this computation, but on various other grounds, in the early centuries of our era.

At whatever period it may have occurred, the accession of Vamsa Sek'hara seems to have been the result of some political disorganisation of the Pandya kingdom, as the different authorities concur in considering him as the founder of a new dynasty. The *Madura Puràna* describes him as the first prince who reigned after the recovery of Pandyam from the waters which had deluged the world, and as receiving from Múla Linga, instructions for the readjustment of the limits of the kingdom; in which latter account the different authorities concur. They also agree in representing him as the founder of the fort and palace of Madura, of various temples and public buildings, and as the restorer or enlarger of the ancient city. It is not improbable, that the extensive remains of these buildings still in existence, and calculated by their massiveness to defy the unassisted effects of time, are, in part, relics of the works of Vamsa Sek'hara. The fort of Madura is at present about three miles and three-quarters* in circumference, and includes the ruins of the palace, the temple of Choka Nat'h, and the Choltri of Tirumalla Nayaka. The latter is a modern building: and the same period witnessed considerable additions to the palace, which, probably, occasioned the mixture of Indian and Saracenic architecture observed by Daniel; as, in the fifteenth and sixteenth centuries, the latter seems to have been introduced from Persia by the Mogul emperors, and engrafted upon the square and massive, although florid, style, which may be regarded as exclusively Indian. This style is evident in the pagoda of Choka Nat'h and its adjoining arcades, and bears testimony to their claims to very respectable antiquity. Vamsa Sek'hara is said to have also re-established, or possibly he introduced, the practice of carrying the god abroad, on particular festivals, in large cars magnificently ornamented, and dragged by the people.†

The reign of Vamsa Sek'hara was also distinguished by an event which led to important consequences to the literature of the peninsula, and which is one reason for placing his reign in the earlier ages of Christianity. This was the foundation of a College at Madura, for the cultivation, it would appear, of profane literature and the Tamil language. The different authorities agree in this account, dividing the merit of the act between Vamsa Sek'hara, and his son and successor,

* Hamilton's India, vol. ii. p, 469.

† Le Père Bouchet au Père * * *, Lettres Edifiantes, vol. xiii. p. 126; Blackader, Archæologia, vol. x.; Daniel's Oriental Scenery; and Langles' Monumens de l'Hindoustan, vol. ii.

Vamsa Churàmani, also called Champaka, who, probably, completed what his father only commenced.

The professors of the Madura college were at first forty-eight in number, called the *sangattár*, or assembly. The chief of these were Narakira,* Bána, and Kapila, of whom no works remain. These received instructions in the *Sútras*, or rules, of the Dravira language, it is said, from the god Siva himself, who appeared amongst them as the forty-ninth professor, and enabled them to expound and propagate the primitive institutes of the language, which are invariably attributed in the Dekhin to the Muni Agastya. The cultivation of the Tamil language, as has been noticed above, is supposed by Mr. Ellis to have preceded that of Sanskrit in the south; and this would be a circumstance in favour of the early existence of the *sangattár*, for it could not have been long after the Christian era that the fables of Northern India were domesticated in the peninsula. However, the opinion evidently is correct only within certain limits. The Sanskrit language, in prayers, hymns, and legends, must have accompanied the introduction of the Saiva faith anterior to the Christian era, and must have been cultivated as far as it was connected with religion. Its profane literature, and even its Pauranic mythology, may have subsequently become objects of study; and they apparently superseded the cultivation of the native tongue, till the eighth or ninth century after Christianity, when its revival was effected, as we shall hereafter have occasion to notice.

The prominent figure which Agastya is thus made to assume in the literary history of the south of India, attaches an interest to his existence which, it is to be apprehended, will scarcely derive much satisfaction from the accounts of this sage which are recorded. In the first place, a high antiquity must be assigned to him on the authority of the *Rámáyana*, the oldest work, after the *Vedas*, perhaps in the Sanskrit language. His migration to the south is there detailed;† and, disregarding the fabulous motives assigned for his residence there, it seems not a forced conjecture to infer his being a chief agent in diffusing the worship of *Siva* in the Dekhin. Neither this remote date, nor his character as a foreigner, renders it likely that he was the first Tamil teacher; and if we are not allowed to suppose that this character originated in his legendary reputation, we must conclude that the author of the various works attributed to Agastya was a different individual, although of similar name. There are still many works current attri-

* I have already observed the *Pandya-Rájákál* is ascribed to them, apparently erroneously. To Narakira is assigned the tale of *Alakésa*, or king of Alaká, and his four ministers; but the style is unfavourable to its supposed origin,—Tamil works being difficult in proportion to their antiquity, so that the oldest are now unintelligible to ordinary scholars.—Kindersley's Hindù Literature, p. 47.

† In the Aranya Kándam.

buted to Agastya, besides his grammatical aphorisms. These consist of poems in praise of Siva, and a number of medical works.* It is not very probable, however, that the appropriation is generally correct.† At the first institution of the Madura *sangattar*, it would appear that some dispute arose immediately between the professors and the Saiva priests, connected, not impossibly, with that contention for pre-eminence of knowledge which has ever prevailed in the Tamil countries between the Brahman and inferior castes.‡ The priests, however, proved the more powerful; and a reconciliation took place between them and the literati of Madura. At least, we may thus interpret the legend of Narakira incurring the wrathful glance of Siva, and only escaping being burnt to ashes in the flames emanating from the eye in the forehead of the god by plunging into the holy pool Pattamàri, and there composing the Andàdi Pànyam, a poem in honour of Siva. After this event the parties continued upon good terms; and Siva presented to the professors a diamond bench of great critical sagacity, for it extended itself readily for the accommodation of such individuals as were worthy to be upon a level with the sages of the *sangattar*, and resolutely detruded all who pretended to sit upon it without possessing the requisite qualifications. In other words, the learned corporation of Madura resembled learned bodies in other countries, and maintained as strict a monopoly as they possibly could of literary reputation.

The foreign transactions of Vamsa Sek'hara's reign were limited to a war with Vikrama, the Chola prince, who besieged Madura, but was repulsed with the aid of Siva. The son of this prince was more fortunate; and he was engaged in disputes of no more serious a nature than those which were engendered by the rivalry of his literary dependents.

* One of these, the *Agastyar Vaidya Anguru*, is cited by Dr. Ainslie, Preface to the Materia Medica of Hindustan.

† In a manuscript account of Agastya, in the Collection, List, No. 14, thirty-eight works attributed to him are said to be still current. His grammar is, however, said to be lost, in consequence of a curse denounced upon it by Tulagappyam, the disciple of Agastya, according to some legends. In a MS. written by an intelligent native, and already referred to under the title of *Chola Pùrvika Charitra Vyákhyanan*, it is said, that the reputed invention of the Tamil language by Agastya is very improbable, as, in the medical works uniformly ascribed to him, the style indicates a very confined possession of the language; and as to the *Agastyam*, or Grammatical Institutes, said to be lost, there is little reason to suppose it was ever written, as least by Agastya, as he never mentions it, although he states in his *Gnyánam*, or work on theology, that he has written a lack of sentences on theology, an equal number on alchemy, and two lacks on medicine. These inferences are scarcely questionable, as applied to an Agastya of, perhaps, the eighth or ninth century; but the traditions that ascribe the introduction of letters and religion amongst the people of Drávira to an earlier teacher of that name, do not seem to have originated wholly in imagination.

‡ Ellis on the Málayálam Language, p. 26.

From Vamsa Churámani,* we have again a considerable interval without the specification of events as well as names, until the reign of Kuna Pandyan. There are, however, one or two legends which are variously appropriated, and which may, therefore, be employed to fill up the chasm.

The fifteenth prince from Vamsa Churámani is called in the lists Kulása, who was also a patron of literature, and a man of letters himself. This latter character induced him to treat a man of great acquirements, named Yeddakattan, with disrespect. Yeddakattan complained to the deity Sundaréswara, and, withdrawing from Madura to the north of the Vaiki river, was followed by the god, and by the professors of the college. This desertion bringing the king to a sense of his improper conduct, he had recourse to prayer and solicitation, and appeased the offended god, and the more irritable poet; and the temple and college recovered their inmates.

Kulasa was succeeded by his son Arimerddana, celebrated for his illustrious minister Mànikyavàsaka, who was especially instrumental in re-establishing the Saiva worship, and expelling the Bauddhas. The authority of that MS. which appears to be the abridged *Madura Purána,* associates this minister and this king; but the larger work relates the marvels usually narrated of Manikyavasaka, of Tennaven Paramaràya, minister of Vamsa Sek'hara, identifying these two persons. There can be little doubt, however, that Mànikyavàsaka, whether he were a political character at all, was long subsequent to Vamsa Sek'hara; and it is only a question, how much more modern he may be regarded. He is anterior, it appears, to the reformers of Kuna Pandyan's reign, by the testimony of both our authorities and others, of which one places him A. D. 490, and another states his work to have been written above a thousand years ago.† In his life, it is particularly stated that the sectaries he combated were Bauddhas, not Jains, who were the heretics of Kuna Pandyan's reign; and these concurrent considerations warrant the inference, that he may be placed with safety between the fifth and eighth century of the Christian era. We need not detail the marvels recorded of him, as that has been fully and correctly done by a European writer already.‡ His works, which are said to be very difficult, are the *Tiruvásagam* and *Tiruchittambala-*

* With whom the *Pandya Rajakal* closes, as observed above. So does the translation of the *Tiruvaleyadal;* but the original descends to Kuna Pandyan, as does the *Halasya,* filling up the interval, however, with mere names. MS., No. 8, gives the substance of their contents.

† Life of Mánikyavásaka, MSS. No. 15; List of Tamil Authors, MSS, No. 9; Vadur Sthala Máhátmyam; Mackenzie Collection, vol. i. p. 201.

‡ SONNERAT's Voyages.

kavi, poems in praise of the Saiva worship.* The scene of his contest with the Bauddhas was at the temple of Chidambaram, and his opponents chiefly teachers from Ceylon,† the king of which country, it is said, was present at the controversy. The Bauddha disputants, it is asserted, were converted to the orthodox faith, and no persecution appears to have ensued.

Another barren series of names occurs between Arimerddana and Kuna Pandyan, who appears as the twelfth successor of that monarch. According to some traditions, the date of Kuna Pandyan is called 950 of Salivahana, or A. D. 1028;‡ but there are several reasons for supposing this to be erroneous. The *Madura Purana*, and its original, the *Hálásya Máhátmya*, come down to the end of this prince's reign; and they are attributed to the reign of Hari Vira Pandyan, in 973, giving an interval of but twenty-three years for their composition, and for the bold assertion of marvels which it could not be supposed they would venture to advance at a period so close to the realities thus distorted. Either their date, therefore, is erroneous, or that of Kuna Pandyan is incorrect; but there is every reason to suppose they are not much misplaced, as the zeal of the Saiva priests and writers to whom these and other compositions of the same period are evidently to be assigned, was, no doubt, particularly active in and about the ninth century. Again, the chief instrument in the religious revolutions of the Pandya state that occurred in this reign was a Saiva priest, Gnyana Samandar,§ whose works, and those of his first converts and disciples, Appa and Sundar, are well known in the south, and are uniformly referred to the ninth century;|| whence it follows that we must place Kuna Pandyan about that time. The date derives some confirmation from its agreement with the period when the Jain religion, of which Kuna Pandyan was a votary, had grown into credit in the neighbouring regions.¶

Whatever may have been the date of this prince, it appears that prior to his reign two events of some importance had occurred in the

* Account of Tamil Works, No. 9; and List of Tamil Authors, No. 10.

† Life of Mánikyavásaka. ‡ List of Tamil Authors, No. 10.

§ WILKS, on the Authority of a MS, in the Mackenzie Collection, calls him a Pandaram, or Sudra priest of Siva (vol. i, p. 156). This does not appear, however, from any of the MSS. consulted on the present occasion. Gnyána Samandar Charitra, Mackenzie Collection, vol. i. p. 203, App. xix.

|| They are joint authors of the *Tévaram*, hymns in honour of Siva.

¶ The earliest Jaina inscriptions of an authentic character that have been found are those of kings of Humchi, dated Salivahana 804, 819, 82e, &c. To them succeed the grants of the Belal kings in the eleventh and twelfth centuries.

Pandya kingdom, which are, not improbably, connected, although the connexion is not adverted to in any of the native accounts. These are the abolition of the *sangattar*, or Madura college, and the establishment of the Samanal religion.

The abolition of the *sangattar* is narrated in the usual marvellous manner.* A candidate for the honour of a seat on the bench of professors, appeared in the person of Tiruvalavar, a pariah priest of Mailapur,† and the author of an ethical poem. The learned professors were highly indignant at his presumption, but, as he was patronised by the raja, they were compelled to give his book at least the trial. For this purpose it was to find a place upon the marvellous bench, which the professors took care to occupy fully. To their astonishment, however, the bench extended itself to receive the work, and the book itself commencing to expand, spread out so as to thrust all other occupants from the bench. The raja and the people of Madura witnessed the scene, and enjoyed the humiliation of the sages; and the professors were so sensible of their disgrace, that, unable to survive it, they issued forth, and all drowned themselves in a neighbouring pool. In consequence the establishment was abandoned.

If we contemplate this event in a literary view alone, we need not be at a loss to understand it. The first professors were eminent in Tamil composition, for the cultivation of which the college appears to have been founded. The members, however, had subsequently, in all probability, directed their attention more to Sanskrit composition, and had, at all events, neglected the cultivation of their native literature. That the latter was the case, is evident from the remark of Avayar, that the old Tamil was preferable to the new;‡ indicating that, even in the ninth century, the dialect had been so far neglected as to have become partially obsolete. With Tiruvalavar, however, circumstances changed. The old system was subverted, and a new impulse was given to the study of Tamil, which produced, in the course of the ninth century, in the Pandya and Chola kingdoms, a number of the most classical writers in the Tamil tongue.§

The date at which the subversion of the college occurred, is another subject of enquiry, and, if we trust to the tradition which connects it with Tiruvalavar, we must identify it with the period of his existence. Other legends make him a brother of *Avayar;* but, as this family

* Account of the Madura Sangattar, vol. 16.

† St. Thomé. Possibly, therefore, something of an attempt to propagate Christianity is here blunderingly and imperfectly narrated.

‡ Asiatic Researches, vol. vii. ; Dr. JOHN on the Life and Writings of Avayar.

§ As Gnyana Samandar; Appa and Sundara, above noticed; Avayar herself, and Kamban, the translator of the *Ramayan*.

story is altogether fabulous,* no stress need be laid upon the assertion. The MS. list of Tamil authors states his work to be 1600 years old: and Mr. KINDERSLEY, who has translated a prose version of part of it,† mentions that the original is understood to have been written fourteen hundred years ago. He also notices the extreme difficulty of the style, from which a high antiquity may be inferred; and, from these considerations, we may conclude that the age of Tiruvalavar may have been between the sixth and ninth centuries.

As far as we can judge from the extracts of the *Kadal,* which have been translated, we have some reason to suppose that their author was not a very orthodox member of the Hindu faith. He appears to have advocated moral duties and practical virtues above ceremonial observances and speculative devotion, and so far trespassed upon the strict law. By his allusions to the heaven of Indra, and to various parts of the regular pantheon, as well as the respect he inculcates to Brahmans and ascetics, he does not appear to have been a seceder or a sectary. How far, therefore, he contributed to the introduction of the Jain, or Bauddha faith, into the Madura monarchy, may be doubted, although the diffusion of his doctrines was calculated to undermine the Brahmanical system. At any rate, it is agreed that the kings of Madura had adopted sectarial principles, and that Kuna Pandyan was a follower of the Samanal doctrines, intending by those the Jain faith; although the term will apply also to that of Buddha, with which there is equal reason to identify it.

Some traditions assert that this heresy was introduced from Ceylon. In that case it was the faith of the Bauddhas. The same also aver, that when the heretics were banished they were exiled to that island,—a legend leading to the same conclusion. On the other hand, the expulsion of the Bauddhas from India appears to have been the work of earlier periods, whilst the remaining records of the kings of Húmchi, and the Belal princes, shew that in Mysore the Jain religion was established at this period; and at Madura, the first converts of Gnyana Samandar are usually considered to have been Jaina authors. We may, therefore, consent to call the religion of Kuna Pandyan, Jaina; but the truth seems to be, that neither Jaina nor Bauddha doctrines ever gained an extensive footing in the southern divisions of the peninsula, which have maintained from the earliest to the latest periods an undeviating fidelity to the worship of Siva and the Lingam.‡

* It is detailed at length by Dr. JOHN.

† Extracts from the *Tiruvalavar Kadal,* or *Ocean of Tiruvalavar.*—KINDERSLEY'S Hindu Literature. See also Extracts from the same, or *Tiruvalavar Koral,* by Mr. ELLIS; Mackenzie Collection, vol. i. p. 232.

‡ Some of the traditions of the Jainas assert, that Chamunda Raya, who erected the image of Gomateswara, was minister of Raksha Malla, a king of Madura, in the year of Kali 600. This account is rendered suspicious by the antiquity of the date, even if we

Kuna Pandyan was married to Vani Daswani the daughter of the Chola Raja, who was a devout worshipper of Siva.* She invited Gnyana Samandar, a famous teacher of her sect, to Madura, and an opportunity soon occurred of gaining for him the countenance of the Raja Kuna, who was attacked by a fever which resisted the drugs and spells of his Jaina priests. Gnyana Samandar undertook his cure, engaging to make his success a test of the superiority of his religion. His opponents accepted the challenge; and the medical skill of the Saiva surpassing their expectations, they found themselves vanquished. Attributing the success of Gnyana Samandar to magic, they proposed other tests, to which he readily agreed. Leaves, with the sacred texts of their respective parties were thrown into the Vaiki, under a stipulation that the sect should triumph whose *mantra* floated upwards against the current. The Saiva charm prevailed : it ascended the river to a place called Tiruvedaka, where Siva, in the form of an old man, took it out of the water, and brought it back to Gnyana Samandar. In commemoration of the event, a city was founded on the spot to which the leaf was borne, and a temple was erected by the king to Tiruvedaka Nat'h. The Samanal were persecuted and hanged, or banished, to the number of eight thousand. Kuna Pandyan, who before his conversion was deformed, as his name implies (Kuna meaning "hunch-backed"), no sooner received the initiatory *mantra* of the Saiva faith, than he became erect and straight, and thenceforth assumed the name of Sundara (the "handsome") Pandyan. Gnyana Samandar was established as the chief pontiff of the religious faith which he had restored; and he seems to have instituted a peculiar hierarchy which still subsists, several convents being found in the south of India tenanted by Brahmacharis, or cœnobites, of the Saiva persuasion, whose spiritual head bears the hereditary title of "Gnyani Siva Achari."†

suppose the Kali, or fifth age of the Jainas, to be intended, by which the date will be reduced to about thirty years B. C. Besides, in the published account of this place and image by Colonel Mackenzie, the country of the minister and king is not mentioned (A. R. vol. ix. p. 262), except in a general way, as lying in the south. Chamunda Raya, in another place, is called a king of one of the Chola or Belala races (p. 246). There is nothing in the local traditions of Madura to warrant the assertion. The princes of the name of Malla, it may be observed, reigned in the Carnatic and Mysore in the eleventh and twelfth centuries; and an inscription of a grant by Raksha Malla, printed in the *Asiatic Researches* (vol. ix.), is dated Sal. 1090, or A. D. 1173 (p. 431).

* In an account of the Gopuram of the Bauddha temple at Púdcovaily, this lady is named Mengayakarasi, and called the daughter of Kerikála Chola, who ruled, it is said, A. D. 478.

† Account of the Gnyana Siva Acharis, MSS. No. 17. Colonel Wilks, as observed before, identifies these with the Pandarams, or Jangamas, but this is very questionable. They do not seem to be known as a religious order above the Ghats. In the Carnatic the name has been adopted within the last fifty years, I understand, by a set of Saiva teachers, who officiate as the priests of the blacksmith caste.

The chief and primitive establishment of the order is said to have been founded at Tinnivelly, but it has since been destroyed. It is asserted, that there have been one hundred and thirteen successions of the chiefs of this religious order; a series which would reasonably allow a period of ten or eleven centuries since its first establishment, and so far corroborates the view of Kuna Pandyan's date in the eighth or ninth century of the Christian era.*

The approximation thus made to modern times, is not attended with any great improvement in historical precision. The great outline is clear enough, but the details continue imperfect. In the ninth and tenth centuries, the Chola princes extended their power throughout a great portion of the peninsula, and overshadowed the splendour of the neighbouring kingdom of Pandya. To them succeeded the Belala princes of Mysore, before whose ascendency the ancient honours of Pandya, and the later glories of Chola disappeared. The decline of the Belalas failed to restore the older dynasties to their pristine authority, as, during the period of their depression, the provinces and chieftainships, once attached to these states, had taken advantage of their weakness to assume independence. This disorganised condition of the southern states was perpetuated by the confusion and alarm incident upon the Mohammedan aggressions which began in the fourteenth century, and which were followed close by the extended dominion of the Vijayanagar kings, whose officers finally established themselves, in the beginning of the sixteenth century, in the seat of the Pandya monarchs. Their history has been recorded with something like accuracy and consistency, and sheds a ray of light upon the close of the Madura chronicles. But, before we particularise the events ascribed to these princes, we must advert to the transactions which fill up, however imperfectly, the interval between the reign of Kuna Pandyan and supremacy of the Nayaks of Madura.

According to one authority, which brings down the Pandya history from the earliest to the latest periods,† the first series of monarchs, consisting of seventy-two princes, was followed by another of twelve, with the last of whom, Kodocola Pandyan, the succession of Pandya

* Mons. LANGLES (Monumens de l'Hindoustan, vol. i. p. 98), observes of Kuna Pandyan, that his expulsion of the Samaneans must have happened after the middle of the twelfth century. His authority is the History of the Danish Missions; and the grounds of the estimate are not stated. The same work says Kuna Pandyan was the three hundred and fifty-ninth king of a dynasty of three hundred and sixty-two; it seems, therefore, that the compilers of the Danish History, have had no better guides than those we have access to, and that, consequently, no particular weight attaches to their deductions.

† Account of the Pandya Rajas who reigned at Madurapuri, No. 28. See List, No. 1, series 2.

princes of the ancient royal family, ceased. According to the legend, this king unjustly condemned to death a merchant of Congeveram, whom business had brought to Madura. Upon hearing of his fate his wife followed him to that city, where, ascending a funeral pile, she denounced an imprecation upon the place and its sovereign. In consequence of this denunciation, Madura was shortly afterwards almost wholly consumed by fire, and the king and all his family perishing in the flames, the Pandya dynasty was destroyed.

The twelve princes of this list apparently commence with Kuna Pandyan, under his new title of Soma Sundara, and should, therefore, advance to the eleventh century at least; but it may be doubted whether it is very accurately compiled. A distinguished name in Tamil literature is that of a Pandya prince, who is sometimes called Hari Vira, and at other times Adi Vira Pandyan. He is the reputed author of various translations from Sanskrit,* and is said to have flourished in 973 of Salivahana, or A. D. 1041; and his name is not found in the list here referred to, or in any subsequent ones, although there is no great reason to question the correctness of his supposed era. There are, indeed, corroborative proofs of its accuracy. A history of the kings of Konga, after that country had become subject to the Chola princes, gives an account of a war between Vira Pandyan and Divya Raya, in which the former was defeated and taken, and had his ears cut off. And in the next reign, the Chola army advanced to Madura and took the city, the Pandya prince saving himself by flight. He was restored subsequently by the Chola monarch, on account of the relationship subsisting between them, but appears thenceforward as a subordinate and tributary prince. These events are placed by the Konga history† in the end of the tenth century, which is as near to the traditionary accounts of Hari Vira's date as we can well expect. Perhaps it is not very unreasonable to connect the tradition above cited of the conflagration of Madura, with the account of its capture in the Konga history, and to infer that they both relate to the same events; or the occupation and partial destruction of the capital, and temporary subversion of the state by foreign invasion, in the beginning of the eleventh century.

The history of the kings of Pandya relates, that the overthrow of the dynasty was succeeded by an interval of anarchy, the duration of which is not specified. At the close of the period the throne was taken possession of by an adventurer, the son of a Brahman by a dancing girl, and a native of Kolam, near Madura, who assumed the name of

* The Kasi Khanda of the Skanda Purana, the Kurma and Linga Puranas, and the Naishadha.—*List of Tamil Authors.*

† Konga Desa Raja Cheritram, translated from the Tamil, 18.

Chandra Kula Dwipa.* He was succeeded by fourteen princes, in the reign of the last of whom the province of Madura was first assailed by the Musalman arms; an occurrence which enables us to form some estimate of the dates of preceding transactions.

The first Mohammedan invasion of the Dekhin occurred in the reign of Alla-ad-din in 1293. The first army that crossed the Krishna† was led by Kafur, or Malek Naib, in 1310-11; and, as he carried his conquests to Rameswar, the work cited may possibly refer to this incursion. According to another authority, the event was dated in 1325, which is sufficiently near, unless, which is not improbable, the allusion blends the first and second invasion together, in which last Mujahid Shah,‡ in 1374, overran the countries between Vijayanagar and Cape Comorin, and advanced to Rameswar. In either case we have a period of less than three centuries assigned to fifteen princes, which would leave no very disproportionate average for their reigns, except that, as the whole season was one of tumult and disorder, and as the rulers were usurpers and intruders, they must claim considerably less than the average duration which might be assigned them in tranquil times, and under long prescriptive sway.

Any deduction to be made from the average duration of the reigns in question, may partly be filled up by the period of anarchy which succeeded the destruction of Madura. How long this continued does not appear; nor, indeed, can its existence to the full extent of the authority here followed be admitted. The sovereign of Madura, deposed by the Chola prince, was subsequently restored by him; and in the inscriptions of the Belala race, in the eleventh and twelfth centuries, it is said, they made the kings of Madura their tributaries.§ It is probable, therefore, that legitimate princes of the ancient house continued to sit on the throne of Madura, some time after the capture or conflagration of their capital, till, weakened by foreign aggression and domestic disobedience, they finally yielded to the enterprise of an adventurer, and the establishment of a new dynasty.||

* List, No, 1, series 3.

† SCOTT's History of the Dekhin, Introduction, p. xiii, ‡ Ibid. vol. i. p. 42,

§ As late as the reign of Vira Narasimha (1149 to 1172).

|| Toward the end of the thirteenth century, MARCO POLO calls the king of that part of the peninsula opposite to Ceylon, and the site of the pearl fishery, Sender Bandi. Il (Re) principale che é capo della provincia si chiama Sender Bandi, nel suo regno si pescano le perle. MARSDEN conjectures Chandra Bandi may be understood to signify the "slave or servant of the moon," 627, note 1257; but the Madura records furnish us with a much more obvious derivation. The king Sender Bandi may possibly be the Chandra Pandi, or Pandya of the text. If this is not thought satisfactory, it may be a slight corruption of the hereditary title of the prince of Marwar, in whose boundaries the pearl fishery lies, and who has been for a long period past entitled the Sétu Pati, or Lord of the Bridge; the ridge of rocks between Rameswar and Manar.

The invasion of the Musalmans was attended with the downfal of the usurping dynasty; and, after a short interregnum, a prince, descended from the ancient rajas, was placed upon the throne with the assistance of the Canara people, it is said; but, probably, the Raya of Vijayanagar is intended, to whom, at an early period of that empire, or shortly after the middle of the fourteenth century,* the Pandya kingdom probably became tributary. The prince placed upon the throne was named Soma Sek'hara, and he was followed by a series of seventeen princes to Chandra Kumara Pandyan, when an officer of Krishna Ray established the line of Telinga princes, generally termed the Naiks (Nayakas) of Madura, and abolished the shadow of authority retained by the Madura kings over a portion of the ancient kingdom, now restricted almost to the boundaries of the capital.

Besides the earlier encroachments made on the east and north by the Tanjore princes, and on the west by the Belal rajas, the interval that elapsed between the Musalman invasion, and the establishment of the Vijayanagar Nayakas on the throne of Madura, had witnessed the separation of the southern provinces from the ancient dominion of the Pandya kings; and, particularly on the eastern coast, the extensive districts of Ramnad and Marawa, became, and ever afterwards continued, independent of the Pandya sovereignty, of which, for many ages, they had formed important divisions.

After the establishment of the chiefs of Marawa or Ramnad, as independent princes, adulatory ingenuity was employed to devise for them an honourable origin. The founder of the family was accordingly made contemporary with Rama, who having, after his conquest of Lanka, erected a *linga* on the small island opposite Manar, which was thence denominated Rameswar, consigned the hereditary charge of the deity and temple, and superintendence of the pilgrimage, to the Adi Setu Pati, or first lord of the causeway.† The effort to aggrandise the ruling family here ceased; and, during an uncertain and protracted interval, the supposed descendants of this chief continued, it is ad-

* One account (Sketch of Madura History, No. 19) says, the country was governed from 1370 to 1402 by Mysore viceroys, when two chiefs, named Ellakana and Mathuna, held it till 1448; then resigning it to a prince of the old dynasty. That the Mysore or Belala princes exercised a supremacy over Pandya, is unquestionable, but it must have been earlier than the period here mentioned, as by the first date (1370) the Belala power had been overturned. The authority exercised by them aud the Vijayanagar kings, too, did not, probably, involve the removal of the native princes; and this probability is converted into certainty, as far as affects the latter, by the appearance of inscriptions in the name of Vira Pandyan, one of which is dated 1402 Sal., in the fifth year of his reign, and a subsequent one in the fifteenth, or Sal. 1412 (A. D. 1490); a short time, therefore, before the final eradication of his family.

† General History of the Kings of Ramnad, or the Setu Pati Samasthanam, 20; Memoir of the Setu Pati, 21.

mitted, dependents and servants of the Pandya monarchy. A few years after the irruption of Mujahid Shah, or about 1380, the governor of Ramnad threw off his dependence on Madura; and his successors extended their authority to the neighbouring provinces, since called the Great and Little Marawas. Family dissensions, fostered by the Nayakas of Madura, or Tanjore, subsequently divided these districts into separate chieftainships; and the aggression of their neighbours, as well as their domestic feuds, prevented the power of the Setu Pati from ever acquiring a permanent or consolidated form. The Telinga princes of Madura, and the Mahratta rulers of Tanjore, claimed, and occasionally exercised, the supreme authority; and latterly, the Nawabs of the Carnatic assumed a sway which in general was little more than nominal. Finally, the Madras presidency collected the tribute of the two Marawas from the year 1792, and in 1801, by treaty with the Nawab of Arcot, obtained the complete sovereignty.*

The Setu Pati was not the only prince who, in this distracted state of the kingdom committed encroachments on its territorial possessions; and even the adjacent province of Tinnivelly was detached from its connexion with Madura, under the administration of the Nayaks. This dependency was, however, recovered; but it subsequently was occupied by an independent Poligar, till the Nawab of the Carnatic extended the pretensions of his authority over this part of the peninsula, which, along with the rest of his rights, were converted into substantial possession by the British government. Besides Ramnad and Tinnivelly, a variety of petty chieftains assumed independence; and, upon the occupation of Madura by the first Nayak, five Rajas are said to have combined to revenge the wrongs of the ancient dynasty of Madura. These petty chiefs were the ancestors of some of the Poligars of the south, who gave so much trouble to the British forces in the middle of the last century. Others originated with grants made by Viswanath Nayaka, about the middle of the sixteenth century, to the rebel leaders who had co-operated with the Vijayanagar arms in the final overthrow of the Madura monarchy.† Of these petty chiefs living by plunder and violence, the native lists enumerate seventy-two in the Tinnivelly and Trichanapali districts. Their numbers must, of course, have been subject to perpetual fluctuation, and increased or diminished with the absence or existence of any one preponderating power amongst them. The nature of their habitations, in the bosom of unhealthy and almost inaccessible wilds, gave, however, a certain security to their existence; and the efficiency of the native government was never such as to accomplish their suppression. Through a period of three centuries,

* HAMILTON, vol. ii. p. 473.

† MUTIAH's History of the Nayakas of Madura, 22.

therefore, the southern portion of the peninsula was parcelled out amongst a number of petty chiefs, scarcely to be dignified even as commanders of banditti ;* their predatory followers preferring a system of insidious pilfering to open plunder, and rarely venturing, without decided superiority of number or position, to face an enemy in the field. Too indolent to till the soil, too insecure to desire fixed property, they lived by hunting and robbery, and were, therefore, but little disposed to check the luxuriance of rank vegetation, which yielded them at once subsistence and shelter. It is not surprising, therefore, that the countries which the Poligars occupied should have been overrun with inhospitable and noxious forests ; and, it may be concluded, that had not a wise and powerful policy interfered to enforce the habits of social life, the fine districts to the south of the Kaveri, most admirably fitted by nature to support an industrious population, would have reverted to the state in which tradition describes them long anterior to Christianity, and would once more have become a suitable domicile for none but the goblins of Ravana, or the apes of Hanuman.

The princes of Vijayanagar had established their supremacy over most of the countries south of the Krishna river before the sixteenth century, but they appear in general to have left the native princes in

* The state of the countries, and the characters of their Collaries and their other inhabitants, are well described in ORME's History ; and their unaltered condition, at a period a little subsequent, is concisely and clearly described by FULLARTON. The extent and dreary aspect of the thickets, as well as the ferocious manners of the people, are also the subject of frequent and interesting description by the members of the Catholic missions, which were sent to this part of India between the end of the seventeenth and the middle of the eighteenth century. See Lettres Edifiantes et Curieuses, vols. x. to xv. The Collars have several peculiar customs contrary to those of the Hindus, particularly the frequency of remarrying allowed to the women, either upon voluntary separation from their husbands, or their death. This custom exists with very few exceptions (MS. Accounts of the Collaries, 25, 26). The pre-eminent power and stability of the *tondiman,* as the principal Poligar chief is called, has introduced a bias to Hindu habits ; and his wives having sometimes been known to sacrifice themselves on the funeral pile, the fashion has gained ground in his dominions. The Collars are chiefly worshippers of Siva and Kali. They are not very rigid in their diet, drinking spirits and eating flesh and fish. The lax observance of the Hindu practices, which prevailed formerly amongst these tribes to a greater extent than at present, may partly furnish a reason to believe that the extensive proselytism effected by the Madura missionaries in these districts was not altogether a fiction. It appears, indeed, that amongst the thirty thousand Christians under the Madura mission, was included a considerable portion of the *calaris,* or thieves. " Je me mis sous la conduite de ce guide qui me fit bientôt quitter le grand chemin pour entrer dans le pays de la *caste des voleurs.* On la nomme ainsi parce que ceux qui la composent faisoient autrefois metier de voler sur les grands chemins. *Quoique la plupart de ces gens-la se soient faits Chretiens,* et qu'ils ayent aujourd'hui horreur de l'ombre même du vol. ils ne laissent pas de retenir leur ancien nom, et les voyageurs n'osent encore passer par leurs forêts. Les premiers missionaires de Maduré furent *assez heureux de gagner l'estime de cette caste* de sorte qu'à present il n'y a guerès de lieu, ou nous soyons mieux reçus et plus en suretè que dans leurs bois."—Du Pére MARTIN au Pére le GOVIEN, Decembre 1700, vol. x. p. 160.

possession of their local sovereignties, and to have contented themselves with enforcing an acknowledgment of their paramount dignity, and exacting in times of emergency pecuniary and military aid. Such was the case with the Pandya and Chola kingdoms, which were governed in the reign of Krishna Raya of Vijayanagar by their own kings. A war broke out between Vira Sek'hara, the Chola, and Chandra Sek'hara, or Chandra Kumara, the Pandya prince, in which the Madura monarch being worsted, he was compelled to fly his country, and, in this distress, had recourse to Krishna Raya for protection and assistance. An opportunity of this nature was not likely to be disregarded by the Vijayanagar court, and Nagama Nayaka, overseer of the royal cattle, was despatched with a considerable force to reinstate the Madura prince, and punish the ambitious presumption of the sovereign of Tanjore. The task was easily effected; and Chandra Sek'hara seated on the throne of his ancestors. His restoration, however, was but nominal, as Nagama Nayaka retained the sovereign authority in his own hands, keeping the king of Madura in confinement, and disregarding the commands and menaces even of Krishna Raya, who found his successful general converted into a rebel.

The valour and conduct of Nagama Nayaka rendering the officers of Vijayanagar reluctant to undertake his chastisement, he seemed likely to maintain his newly acquired authority in perfect impunity.* To the surprise of the Vijayanagar court, however, an antagonist to Nagama was found in the person of his only son, Viswanath ; a son whom he had performed a pilgrimage to Benares to obtain, and whom he had left for education, or who had not improbably been detained as a hostage, at Vijayanagar. As Viswanath Nayak had given many proofs of his military talents, and as his professions of loyalty were credited, he was accordingly intrusted with the unnatural duty of revenging his prince upon a father, and marched with a strong force against Nagama. The father was defeated and taken prisoner, and, according to one account, delivered to Krishna Raya by Viswanath, who replaced the legitimate king of Madura on the throne, and returned triumphantly to Vijayanagar, where, in consideration of the merits of the son, the

* The materials for the history of the Nayaks of Madura, although not very full, are, as far as they extend, satisfactory. They are, 1. A History of the Modern Kings of Madura, by TRIUVERCADU MUTIAH, an ingenious native of the Carnatic, an amusing account of whose studies, written by himself, is published in the *Asiatic Annual Register*, for 1801 ; 2. A History of the Telugu Rulers of Madura, translated by Mr. WHEATLEY from the Tamil ; and, 3. A Sketch of the History of Madura, to the reign of Trimal Nayak, Nos. 19, 22, 23. A fourth account (24) is confined to the affairs of the descendants of Vijaya Ranga Choka N at'h, who died in 1731. It is drawn up by the representative of the family, Vijaya Kumara Viswanath Bhangaru Trimala Nayak, the great grandson of the last Nayak of Madura.

father was forgiven. The king of Madura soon after dying, and leaving no heir, Viswanath Nayak was installed by the sovereign of Vijayanagar as feudatory prince of Madura. Another history of Madura, however, omits these circumstances, and describes Viswanath as the officer sent to the assistance of the Pandya prince, and the usurper of the independent sovereignty. At any rate, it is evident from the tenor of both accounts that Viswanath Nayak first established this dynasty, and that his assumption of the regal authority was acquiesced in by the court of Vijayanagar, too much occupied in watching the proceedings of their new neighbours of Bijapur* to attend to the affairs of the more southern districts.

After the inauguration of Viswanath Nayak, he proceeded to strengthen himself in his new government; and, with this view, having enforced the cession of Trichanapali from the Chola Raja, he improved the fortifications of that stronghold, and built a palace in the fort for his reception. He then directed his attention to the settlement of Tinnivelly and the southern districts, the depopulated parts of which he distributed amongst his adherents, chiefs of the Totia caste, to the number of seventy-two, who were the progenitors of the petty chiefs subsequently known as Poligars. This measure, however, and resentment for the extirpation of the ancient royal family, seem to have aroused the remaining chiefs of that principality to arms, and a force, led by five rajas connected with the Pandya dynasty, opposed the further progress of Viswanath. The quarrel was, however, decided by the personal conflict of that chief with Agra Pandyan, who was selected as the champion of the enemy, and was killed in the combat. According to one of our histories, Viswanath survived his victory but a short period, dying of his wounds on the ensuing day. According to another account, he recovered, and continued to reign long enough to extend and consolidate his power.†

* Established as an independent state in 1489 by Yusuf Adil Khan.—Scott, vol. i. p. 207.

† Although the two histories agree in the main facts, they differ considerably in the details, and especially in the chronology. Mutiah's account places Viswanath's accession, A. D. 1560, the other, A. D. 1431. The former of these best agrees with Krishna Raya's date, and with the previous history of Madura: it may be about forty years too modern. Mutiah's history enumerates but eleven princes between 1560 and 1742, or one hundred and eighty-two years; the other names fourteen princes in three hundred and seven years,—the former giving about seventeen, the latter twenty-two years to a reign. But this proportion is too much, as three of the fourteen princes are three brothers who reigned consecutively, and the average of whose reigns could not, therefore, have exceeded half this number. We shall have a more probable result, if we suppose the number of princes to be, including Nagama, fifteen, and the number of years two hundred and twenty-two, from 1520 (for Krishna Raya, ruled from 1509 to 1530) to 1742, which will give us something less than fifteen years to a reign. Colonel Wilks says, the dynasty of the Nayaks of Madura was founded

The second prince of Madura, Peria Krishnapa Nayak, the son of Viswanath, succeeded his father. He extended the authority of the new family towards the south, reducing to subjection the Poligar of Permagúdi: he enlarged and beautified Tinnivelly, and built a village to the south of Palamcota, called after his own name Kistnapuram. And here, as well as near Tinnivelly, he built a temple of Siva, and a range of dwellings for the residence of Brahmans, attaching to both liberal endowments.

The third prince of this race was the son of the preceding, Peria Virapa Nayak, who emulated his father in extending the authority of Madura, and in founding temples and endowing religious establishments.

The succession of the Nayaks is here differently stated, Mutiah's History passing to a second Krishnapa Nayak, calling him the son of the last prince, whilst the other account states that Peria Virapa Nayak left three sons, Viswapa, Kumara Krishnapa, and Kasturi Rangapa, all of whom succeeded in regular order to the government. The last was succeeded by Krishnapa, who was the son of the second brother, Kumara Krishnapa, and until whose reign no particular transactions have been thought worthy of being recorded.

The most remarkable incident of this reign was the formal acknowledgment of the Poligar of Ramnad, as the sovereign of the eastern coast. This event must have taken place at the end of the sixteenth century; and the accounts of Marawa assert the independency of the founder of the sovereignty about two centuries sooner. They agree, however, with the histories of Madura, in admitting, that about this period, Wodeya Deva was recognised by the king of Madura as the legitimate ruler of Ramnad, and warden of Rameswar; and there can be little doubt, therefore, that the power of the Marawa rulers first assumed a consistent form at the period here described. They were not, however, entirely independent, as, although authorised to extend their authority over their refractory and predatory neighbours, they were required to pay tribute to the Madura government; and they were especially enjoined to give protection to the pilgrims to Rameswar against the Colars and Marawars, who had been accustomed to plunder and harass these devotees upon their passage, so as almost to have deterred the people of other parts of India from undertaking so perilous a journey.

by Nagana Naid (or Naik) about 1532, in the reign of Achyuta Deva, with the aid of a colony of Telingas, which seems to have been planted in the country some time before by the government of Vijayanagar. The descendants of those are the Poligars of the present day, who are undoubtedly of Telinga, not Tamil, origin (vol. i. p. 54, note). Their introduction is differently stated in the authorities followed in the text.

Virapa Nayak succeeded his father. According to one account, Trichanapali was first attached to the government of Madura in his reign, having previously belonged to the state of Tanjore, from which it was obtained by exchange, the fort of Vellam being ceded to that state in lieu of this citadel. The transaction is uniformly so described; but it is referred by other authorities to the reign of Viswanath, the first Nayak, as already noticed, or to that of Tirumalla Nayak, the successor of Virapa.

The accession of Tirumalla Nayak, the son and successor of the last prince, brings us to a period of chronological certainty, and is placed by the different authorities within two or three years of the same date, or 1621, 1623, and 1626. The reign of this prince was long and flourishing, and the public edifices erected during his sovereignty still furnish splendid proofs of his wealth and magnificence.

The affairs of Ramnad form the most important transactions of this reign. Kutan Setupati, the son of Wodeya Deva, who had succeeded his father, left, upon his death, four legitimate sons, and one illegitimate. Of the first, the third son succeeded his father, but the fourth, Adi Narayan, disputed his possession of the country, and, with the assistance of his son-in-law, Tiruvadeya-vanni, a man of great military enterprise and ability, appears to have deposed his brother, and made himself master of Ramnad. The illegitimate son of Kutan, named Tumbi, had recourse to the court of Madura, and easily prevailed upon Tirumalla Nayak to send an army under his general, Ramapya, to put him in possession of what he claimed as his inheritance, a portion of the Marawa principality. Whilst Tiruvadeya-vanni lived, the troops of Madura were successfully resisted; but, upon his dying of the small-pox, a casualty ascribed to the incantations of his enemies, Ramapya overran the country, and taking Adi Narayan prisoner, carried him to Madura, where he was detained in close confinement.

Tumbi Setu Pati was now sole master of Ramnad, but the people contemning the baseness of his birth, withheld obedience to his orders, and, breaking out into open rebellion, he was glad to seek safety again in the court of his patron. The eastern districts were now without a ruler, and the same dangers that formerly prevailed once more obstructing the pilgrimage to Rameswar, the Brahmans and religious mendicants solicited the restoration of Adi Narayan to the government, as calculated to re-establish order and security in the country. Tirumalla complied in some degree with their request; but, acting upon a maxim which has constantly influenced eastern politics, as well as those of more civilised regions, he gave to Adi Narayan, with his liberty, but a third part of his patrimony, leaving another

third in the hands of Tumbi, and conferring the rest on Danu Kanta, the son-in-law of Adi Narayan.

This division of the Marawas, although it laid the foundation of future partitions, did not at that time long continue. Tumbi contrived to put his brother to death, but soon after dying himself, his portion was seized by Vijaya Raghunath, the adopted son of Adi Narayan, who, likewise, gained possession of the state of Danu Kanta upon his death, and thus re-united the three governments under one head. This prince, although he extended his authority over the adjoining districts, continued obedient to the authority of Tirumalla; and, upon the invasion of Madura by a formidable army from Mysore, was highly instrumental in their repulse, leading, with an activity which received the acknowledgment of the Nayak, a considerable force to the assistance of his lord paramount, and mainly enabling him to defeat and expel the invaders.

Although the fortress of Trichanapali was the chief stronghold of the kingdom of Madura, the city of Madura appears to have been the favourite residence of Tirumalla Nayak. We have already ascribed to a much older prince the original construction of the fort, the temple, and palace, of which such stately vestiges still exist. There is no doubt, however, that they owe much of their present form to the taste of Tirumalla Nayak, and the palace of Madura especially shews indications of modern architecture; at the same time, the more celebrated building, still in good order, the Choltri of Tirumalla Nayak, known to be his work, is an edifice purely Hindu, and blends the square and massive character of the general structure with the singularly minute decoration, and luxuriantly fantastic development of the details. The Choltri is a chamber of an oblong square form, the flat roof of which of long stones, rests upon one hundred and twenty-four pillars of stone twenty feet high, and placed in four rows. The pillars are curiously carved with different figures representing stories connected with the Hindu religion, the peculiar legends of the *Madura Purana*, and the persons of the founder, and his predecessors. One pillar represents Tirumalla Nayak himself, with six of his wives, and a number of the women of his haram. The Choltri, it was said, was begun in the year 1623, the second year of the founder's reign, was finished in twenty-two years, and cost above a million sterling. It was built, it is asserted, to receive the Lingam of the great temple ten days in every year, the Brahmans agreeing to bring their divinity forth upon condition of Tirumalla Nayak's providing a suitable place for his temporary accommodation. Besides this Choltri, the same prince is said to have completed three other great works—a pagoda; a tank, three quarters of a mile square, twenty feet deep, and faced with stone; and a grand palace or-

namented with black granite pillars, some of which are twenty feet high cut out of one stone.*

The reign of Tirumalla Nayak was of considerable duration; one account says forty years; another, thirty-six; and the lowest computation, therefore, brings it to the year 1657,† when he was succeeded by his son Virapa, a prince of an effeminate and indolent disposition, and who, accordingly, was unable to repress the incursions of the Mysoreans, under so active a prince as Kanti Deva Nana Raj. They took several places in the western districts during this reign from the Madura Nayak.‡

Chokanath Nayak succeeded his father; he was a prince of some conduct and enterprise, and rendered himself formidable to all his neighbours. He first turned his arms against Vijaya Raghava, king of Tanjore, whom he defeated and put to death, taking prisoner his ally, Surya Deva, the Setupati, and assisting Kilavan, the cousin of the captive prince, to become master of Ramnad. He then invaded the kingdom of Mysore, expecting to reduce it under his authority, but the events of the war reversed his expectations, and inflicted severe losses on the government of Madura.

The son of the late king of Tanjore, Chengamal Das, had made his escape from the fort of Trichanapali, where he had been confined. His escape was effected probably with the aid of Rustam Khan, a Mohammedan chief, who had been a favourite of Chokanath, and who commanded the garrison under the orders of Mudala Rudra Nayak, the brother of Chokanath, an extravagant and indolent prince, who lavished on his personal gratifications the sums destined for the pay of the troops. Taking advantage of their discontent, Rustam Khan liberated himself from all controul, and made himself master of Trichanapali. This event, with the escape of Chengamal Das, encouraged the Raja of Chenji to advance to Srirangam, whilst the raja of Mysore on that side now became the aggressor. In this state, Chokanath found some difficulty in preserving the shadow of his former power, and his enemies retained the superiority for a considerable period, the Mysoreans oc-

* Blackader's Account of the Buildings at Madura, Archæologia, vol. x. Views of the Choltri, &c. have been given by Daniel, and Langles' Monumens de L'Hindoustan.

† It must have been in the early part of this reign that the Portuguese Jesuits, under Robert de Nobilibus, established the Madura mission, although a liberal benefactor to the Brahmans; therefore, Tirumalla Nayak could not have been a bigot. There were two Christian churches in the city of Madura.—*Lettres Edifiante*, xiii. 130.

‡ As Denaikan-cotta, Satyamangal, and other ta'alluks.—Wilks, i. 54. These aggressions are dated 1653 in the History of Mysore, but, as it is said, they were taken from Virapa, Naik of Madura; and, as the character of this prince renders such an event probable, it is most likely that Colonel Wilks's date is a few years erroneous.

cupying even the capital, Madura, it is said, for three years.* It was probably to purchase their retreat that Chokanath ceded to Mysore the districts of Errur and Darapur.† Having thus got rid of one of his most powerful enemies, and being vigourously reinforced by Kilavan Setupati, he next dispersed the troops of Chengamal Das, and re-occupied Tanjore. He finally recovered Trichanapali from Rustam Khan, who lost his life in the defence; and the Chenji Raja retreating to his own capital, Chokanath remained in the tranquil possession of his patrimonial possessions. He soon, however, lost his acquisitions in Tanjore, the fugitive prince, Chengamal Das, having recourse to the Mahratta chief, Ekaji, for assistance. That adventurer, who commanded at Bangalore, under the nominal authority of the Mohammedan court of Bijapur, readily undertook his protection.‡ The confederates marched to Tanjore, and soon expelled the forces of Madura. The Mahratta, presently usurping the sovereignty of Tanjore, was not at leisure to prosecute his success against Chokanath; and these princes very shortly afterwards entered into a mutual confederacy to oppose the incursions of Sevaji.§ These events, which are usually placed between 1675 and 1680, are in perfect conformity with the period of the reign of Choka Nayak as stated in the authorities we have followed, and which date its termination in 1685 or 1687.

Chokanath Nayak was succeeded by his son, Ranga Krishna Muto Virapa, who died young, after a reign of seven or eight years, leaving his wife pregnant with a son, afterwards named Vijaya Ranga Chokanath Nayak. During his minority the regency was exercised by Mangamal, the grandmother of the prince, a woman of great talents and manly spirit. One account describes her as preserving her authority until 1712, but another‖ states, that when the prince was thirteen years of age, the commander of the forces, Kasturi Ranjya, excited an opposition to her which ended in his seizing the reins of government, and in her confinement until her death, which speedily followed. We know, however, that in 1700, she was regarded as the ruler of Madura for her grandson,

* MUTIAH 's History. The fact is confirmed by the *Lettres Edifiantes.* One, dated 1719, observes of the Christian churches at Madura,—Ces Eglises furent tout à fait renversés lorsque la ville fut prise et ruinée en partie par le Roi de Mayssur. Vol. xiii. p. 131.

† WILKS, i. 58.

‡ This is rather differently narrated in the Pratapa Vamsavali Bhosla. There it is said the prince of Trichanapali applied to Shahoji for assistance against Vijaya Raghava, prince of Tanjore. That Shahoji enabled the Raja of Trichanapali to repel his enemy and capture Tanjore, but that he then appropriated the conquest to himself, expelling his ally from the country, and leaving it under the administration of his son, Eekaji.

§ WILKS, i. 78.

‖ MUTIAH'S History.

although the administration of the affairs of the state was in the hands of a governor, or regent, who exercised unlimited authority.*

The reign of Vijaya Ranga Chokanath Nayak was not distinguished by any remarkable event. He died in 1731,† leaving no child; he was, therefore, succeeded by his wife, Minakshi Amman, who adopted Vijaya Kumara, the son of Bhangaru Trimal Nayak, a descendant in a direct line from a younger son of Tirumalla Nayak. This adoption was enforced by the law of the country, so that Minakshi Amman was in fact only regent during Vijaya Kumara's minority. The adoption was generally acceded to by the ministers and men in authority, but it was disputed by Bhangaru Tirumalla Nayak, the father of the youth: he claimed the inheritance to the throne, and his claims were powerfully supported by the activity and influence of his years and rank. The parties are described in one account as having come to an indecisive engagement; but it is admitted that the matter was, with much less policy, referred to the Nawab of Arcot, who sent his son, Sufdar Ali, and Chanda Sahib, with an army to hear and decide the disputed question. The cause was discussed at Trichanapali, and the general bias leaning to Bhangaru Tirumalla Nayak, he was placed on the throne, presenting three lacks of rupees to his Mohammedan friends, and acknowledging himself the tributary of the Nawab of Arcot.

The same means that had secured a favourable award for the successful candidate, were now employed to procure a reversion of the sentence, and a nazzer of a crore of rupees, it is said, prevailed on Chanda Sahib to undertake the cause of the Rani. These negociations becoming known to Bhangaru Nayak, he quitted Trichanapali, and endeavoured to secure himself in Madura and Tinnivelly, but he was unequal to oppose the troops of the princess, aided by the Mohammedan arms, and, after a few unsuccessful skirmishes, he fled to Sivaganga, where the ruling Setupati, Katta Deva, received him and assigned him some lands for his subsistence. The zeal which Chanda Sahib had displayed in behalf of Minakshi Amman, and the success with which it had been attended were calculated to inspire confidence as well as gratitude; and it was under these impressions that the princess granted free access to the citadel of Trichanapali to her defen-

* "Cette Princesse Mangamal, qui est comme depositaire de la couronne, fait élever avec un grand soin son petit fils, prince agé de quatorze ou quinze ans, à qui le royaume appartient, et confie, cependant, tout le gouvernement de l'état au Talavay, ou Prince Regent."—*Lettres Edifiantes*, x. 171. The letter is dated Avour, in the kingdom of Madura, 11 Dec. 1700.

† Mutiah says 1734, Orme (1, 38), 1736; but our date is confirmed by MSS. 24, which, as a family account of such recent events, seems to be the best authority.

ders. The further precaution, however, was taken, of exacting an oath from Chanda Sahib, that he would not avail himself of this facility to the detriment of his ally. No obstacle, however, was likely to deter this ambitious prince from securing a post of such importance to his meditated schemes of aggrandisement; and, consequently, in despite of oaths and protestations, he presently seized upon the citadel of Trichanapali, and threw Minakshi Amman into prison, in which the queen, overcome by shame and despair, swallowed poison and died, thus terminating the series of the Hindú sovereigns of the Pandya kingdom. Bhangaru, with his son, the cause of these dissensions, continued some time under the protection of the Sivaganga Poligar. They and their descendants were from time to time encouraged by the Nawabs of the Carnatic to expect their restoration to the possessions of their ancestors, but there is no reason to suppose such hopes were ever held out to them in the spirit of sincerity, and it is certain that they bore no fruit. The family remained some time at Vellikurchi, afterwards at Ramnad, and were thence obliged to take refuge amongst the Poligars. After the war with Tipú they returned to Vellikurchi, where they have continued to reside.

It is unnecessary to follow further the history of Madura, as it becomes, from this period, a portion of that of the British empire in India.

LISTS OF THE PANDYAN KINGS.

	No. 1. Vamsavali, Vol.	No. 2. Vol.	No. 3. Madura Purana, Vol.	No. 4. Madura Purana, Vol.	No. 5. Halasya.
1	Kulasek'hara	Kulasek'hara		Kulasek'hara	Kulasek'hara
2	Malaya Dhwaja	Malaya Dhwaja		Malaya Dhwaja	Malaya Dhwaja
3	Sundara	Minakshi and Sundara	Soma Sundara	Sundara	Sundara
4	Vira	Wugra	Wugra	Vugra	Wugra
5	Abhisheka	Vira	Vira	Vira	Avhisheka Vira
6	Vikrama	Abhisheka	Abhisheka	Abhisheka	Vikrama
7	Rajasek'hara	Vikrama	Vikrama	Vikrama	Sek'hara
8	Anantaguna	R. Sek'hara	R. Sek'hara	R. Sek'hara	Kulottunga
9	Kulabhara	Kulottunga	Kulottunga	Kulottunga	Anantaguna
10	Varaguna[2]	Anantaguna	Anantaguna	Anantaguna	Kulabhushana
11	Raja Raja	Bhushana	Kulabhushana	Kulabhushana	Rajendra
12	Raja Gambhíra[5]	Rajendra [hara	Rajendra[4]	Rajendra	Rajesa
13	Chitra Virta	Sundareswara Pada Sek'-	Tari Raja	Rajesa	R. Gambhira
14	Chitra Guna	Varaguna	Udalura	R. Gambhira[5]	P. Vamsapradi-paka[5]
15	Chitra Dhwaja	Raja Raja	Gambhira	P. Vamsadipa	Puruhutajit
16	Chitra Guna	Vamsa Sek'hara[3]	Vengi Adi	Purandarjit	P. Vamsa Pataka
17	Chitra Vikrama	Vamsa Churamani	Purandara	P. Vamsa Vataka	Sundarapada
18	Raja Martanda	Kula Sek'hara	Kumara	Sundaresa Pada Sek'hara	Varaguna
19	Raja Chudamani	Arimerddhana	Vangeya	Varaguna	Raja Raja
20	Raja Sundara	Chokanath	Eradana	Raja Raja	Chitra Ratha
21	Raja Kulottunga	Virabhadra	Sundaresa Pada Sek'hara	Suguna	Chitra Bhushana
22	Raja Sirogicha Gambhira	Vira	Varaguna	Chitra Viratha	Chitra Dhwaja
23	Raja Gambhira	Prakrama	Raja Raja	Chitra Bhushana	Chitra Verma
24	Pandya Vansa Dipa	Suravhi	Suguna	Chitra Dhwaja	Chitra Sena
25	Purandara Sundara	Kunkuma	Chitra Ratha	Chitra Verma	Chitra Vikrama
26	Pandya Vamsa Dhuran-	Karpura	Chitra Bhushana	Chitra Sena	R. Martanda
27	Jannadeswara [dara	Karunya	Chitra Dhwaja	Chitra Vikrama	R. Churamani

	No. 1. Vamsavali, Vol.	No. 2. Vol.	No. 3. Madura Purana, Vol.	No. 4. Madura Purana, Vol.	No. 5. Halasya.
28	Pandu Sek'hara	Puruskottama	Chitra Verma	Raja Martanda	R. Sardula
29	Varaguna	Chatursasana	Chitra Chera	Raja Churamani	R. Kulottama
30	Raja Sardula	Kuna, or Sundara	Chitra Vikrama	Raja Sardula	Ayodhana Pravina
31	Raja Kulottama		Raja Martanda	Raja Kulottama	Raja Kunjara
32	Ayatana Pravina		Sardula	Pravina	R. Bhayamkara
33	Raja Kunjara		Kavi Raja	K. Kunjara	Wugrasena
34	Pravira Raja Bhayanca-		Kulottama	R. Bhayamkara	Mahasena
35	Varoonajana [ra		Tunda Pravina	Wugra Sena	Satrunjaya
36	Satrunjaya		Raja Kunjara	Satrunjaya	Bhimaratha
37	Viravudanda		Raja Bhayamkara	Jayamgonda	Bhima Paracrama
38	Viraparakrama		Rudrasena	Parakrama	Pratap Martanda
39	Pratapa Martanda		Satrunjaya	Pratap Martanda	Vikrama Kanchuki
40	Vikramakaryaka [la		Vinatar	Vikrama Kunchuka	Yuddha Kolahala
41	Samara Sek'hara Kolata-		Viraprakrama	Samara Kolahala	Chaturi Vikrama
42	Antala Vikrama		Pratapa Martanda	Atula Vikrama	Atula Kirtti
43	Antala Kirtti		Vikramakanchuki	Atula Kirtti	Kirtti Bhushana
44	Vamsa Sek'hara[6]		Samara Kolahala	Kirtti Bhushana	Vamsa Sek'hara
45	Pratapa Surya		Yatula Vikrama	Vamsa Sek'hara	Champaka
46	Vamsatulaja		Yatula Kirtti	Vamsa Churamani, or Chanjpaka	Pratapasurya
47	Nipu Marundari		Kirtti Bhushana	Pratapa Surya	Vamsa Dhwaja
48	Chola Vamsottaraca		Vamsa Sek'hara	Vamsa Dhwaja	Vamsa Bhushana[7]
49	Kula Churamani		Vamsa Churamani	Marutakan	Loma Churamani
50	Raja Churamani		Surya Vanjival Dhwaja	Chola Vamsantaca	Kula Churamani
51	Vamsa Siromani		Marutaka	Chera Vamsantaka	Raja Churamani
52	Pandya Gambhira		Pratapa	Pandya Vamsesa	Bhupa Churamani
53	Kuvalatuja		Sovilanki	Vamsa Siromani	Pandya Kulesa
54	Vamsa Vibhushana		Suvangi Sandha	Pandyeswara	Arimerddhana
55	Kulesa		Vamsa Sek'hara II.	Kulodhwaja	Kunapandya[8] [9]
56	Chola Churamani I.		Vamsa Siromani	Vamsa Vibhushana	

57	Chola Churamani II.		Pandeswara	Chola Churamani	
58	Raja Churamani		Kulutoja	Kula Churamani	
59	Bhupa Churamani		Vamsa Bhushana	Raja Churamani	
60	Kulesa II.		Chola Churamani	Bhupa Churamani	
61	Arimarundana		Kula Churamani	Kulesa	
62	Sek'hara Nat'ha		Raja Churamani	Arimatun	
63	Vira Bhagu		Bhupa Churamani	Jagannath	
64	Vikrama Bhagu		Kulesa	Virabahu.	
65	Pracrama Bhagu		Marutan	Vikramabahu	
66	Durmada		Jagannath	Pragramabahu	
67	Karunya		Virabhagu	Suradamaran	
68	Sarvasasana		Vikramabhagu	Bahubala, or Vaguvalen	
69	Sandhatum		Prakramabhagu	Kunkumatanya	
70	Nagarika		Suratamara	Karpura	
71	Chencalneelyetta		Vaguvalatu	Karunya	
72	Vetteya Vinata		Kunkumatennen	Purushottam	
73			Karpura	Satrusadhana	
74			Karunya	Kuna Pandya, or Sundara	
75			Purushottama		
76			Chitra Satana		
77			Kuna, or Sundara		

1 Nos. 3 and 4 should be taken from the same authority by the title, but they do not agree; the second is really from the Teruvaleyadul, which is usually called the Madura Purana.

2 Varaguna is too early in this list by five or six at least.

3 This list omits here between thirty and forty names, whence it is so much briefer than the rest.

4 We have here eight kings between Rajendra and Sundarapada; the two next have but five. With this correction the three agree tolerably well as far as they go.

5 The names of the Chitra family appear transposed in No. 1, as compared with 4 and 5, else they nearly agree.

6 Differs from the rest in not following Vamsa Sek'hara by Champaka, whom it seems to omit altogether; else the three first lists agree tolerably well.

7 The Halasya here omits seven or eight names.

8 The same here omits ten or eleven names.

9 All the lists, except the first, here close, and with the same prince, or Kuna Pandya, with whom the next series, from the same authority, seems to begin. According to the Vamsavali, the seventy-two kings here enumerated reigned in former ages.

10 In these lists the names are often the same though differently written or expressed. Thus, Antala Kirtti (1), Yatula Kirtti (3), and Atula Kirtti (4), are the same name; and Samara Kolahala (1,3,4) means the same as Yuddha Kolahala, "the exulter in battle."

Continuation of List Nos.

Series II.

1. Soma Sundara
2. Karpura Sundara
3. Kumara Sek'hara
4. Kumara Sundara
5. Shamuk'ha Noya
6. Sasiverna
7. Paruva Mantra
8. Pararaja Sena
9. Mugaratoja
10. Satrubhayamkara
11. Satru Sama
12. Kodocola, or Kodungal

Kali, 305. Interregnum.

Series III.

1. Chandrakula Dipa
2. Pulikodi Paruta
3. Minkodi Paruta
4. Magaratuja
5. Martanda
6. Kuvalayana
7. Gunalaya
8. Virabagu
9. Satru Samkara
10. Vira Verma
11. Vernakulottanga
12. Raja Martanda
13. Kulaverddhana
14. Varapunyachari
15. Kulaverddhana 2d.

Invasion of Bahadur Shah.

Series III.

1. Somasek'hara
2. Soma Sundara
3. Raja Raja
4. ————
5. Raja Kunjara
6. Raja Sek'hara
7. Raja Verna
8. Bharata Raja
9. Kumara Sena
10. Bhímasena
11. Pralupa Raja
12. Varaguna
13. Kumara Sundara
14. Varatunga
15. Kulottunga
16. Sundara Kesara
17. Chandra Kumara

Expelled by Virasek'hara, king of Chola.

Restored by Nagama Nayak.

Here begin the Nayaks of whom we have three Lists, one of which is the present.

	Nayaks of Madura, List 1; or, the Vamsavali, Vol.	Mutiah's List.	3. From the History.
1	Viswanath.	Viswanath.	Viswanath.
2	Perya Kistnapa.	Mootoo Kistnama.	Peryakistnapa.
3	Perya Virapa.	Virapa.	Perya Virapa.
4	Viswapa.	Krishnappa.[2]	Viswapa.
5	Perya Virapa.	Mootoo Virapa.	Kumara Kistnapa.
6	Perya Kistnapa.	Terumalla.	Kasturi Rangapa.
7	Kasturi Rangapa.	Mootoo Virapa.	Mootoo Kistnapa.
8	Mootoo Kistnapa.	Chokanath.	Mootoo Virapa.
9	Mootoo Virapa.	Ranga Crishna Mootoo Virapa.	Terumalla.
10	Terumalla.	Vijayaranga Chokanath.	Mootoo Virapa.
11	Chokanath.	Minacshi Ammaul.	Chokanath.
12	Kistna Mootoo Virapa.		Kistna Mootoo Virapa.
13	Vijaya Ranga, as a minor.		Vijaya Ranga, under the regency of Mongamal.
14	Ditto, as of age.		Ditto, of age.
15	Mangamal,[1] his widow.		Minackshi Ammal, his widow.
16	Vijaya Kumar.		Vijaya Kumara.

1 Should be Minakshi.

2 Mutiah omits the three brothers of Virapa, and goes to his nephew. He omits, also, the regency of Mangamal, and the last prince. These five, added to his eleven, the three lists agree.

List of the Manuscript Translations referred to in the preceding Accounts with reference to the Pages, &c. of the Appendix to the Description of the Mackenzie Collection.

1. Vamsavali of the Chola, Chera, and Pandya Dynasties, extracted from a MS. in the possession of Kalinga Raya: and translated from the Tamil by R. Clarke, Esq. cxxviii. vol. i. art. 1.
2. Genealogy of the Pandya Rajas from the Madura Puranam, composed by Parunjothi. Translated by Srinavasia Brahman. Ibid. i. 12.
3. Origin of Madura, with a List of the Kings (List No. 2), and the Limits of the Country. Translated from a Tamil MS. communicated by Mr. Hurdis, by Srinavasia. Ibid. i. 9.
4. List of the Kings of Pandya from the Teruvaleyadal, or Madura Purana. Extracted and translated by Kavele Venkata Lakshmya. MS.
5. List of the Kings of Pandya, extracted from the Halasya Mahatmya of the Skanda Purana. MS.
6. Raja Cheritee; or, Actions of the Vadaka Rajas of Tanjore, Trichanapali, and Madura. cxxviii. i. 8.

7. Madura Puranam; or, Teruvaleyadal of Paranjoti Tamburan. Translated from the Tamil by a native interpreter. Tamil MSS. or class 3, No. 33. cxciv.
8. Puranam, or Ancient History of Madura. Tamil MSS. or class 3, No. 28. Ibid.
9. An Account of the most esteemed works in the Tamil language; from a paper communicated by Mr. COCHRANE.
10. Description of the Dravida country, confined almost to notices of Tamil authors. MSS. class 3. cxcvi.
11. Pandya Raja Kal; a History of the Kings of Pandya Desa. Translated from the Tamil. MSS. class 3, No. 27. cxciv.
12. Account of a hill called Tripurankodum and Skander Mally. MSS. class 3, No. 80. cxcvi.
13. Varaguna Cheritram; a History of Varaguna. MSS. class 3, 26. cxciv.
14. Life of Agastyer. Translated from the Tamil. MSS. class 3, 4. cxcii.
15. Life of Manukyavasager. By VEDANAIK VIDHAGAMA SIROMANI. class 3, No. 3. cxcii.
16. Account of the Sanketar, or Madura College. Translated from a Tamil MS. communicated by MINACSHI NAYAH. cxxviii. i. 13.
17. Account of Gnyana Siva-achari. By NITAL NAINA. Class 3, No. 9. cxciii.
18. Konga Desa Raja Chentram; a History of the kings of Congo. cxxx. vol. iii. 6.
19. Sketch of the History of Madura. cxxxii. vol. iv. 17.
20. History of the Kings of Ramnad. Translated from the original of Soma Sundara Pilla, by CAVELLY VENKALL RAMASWAMI. cxxxii. vol. iv. 21.
21. Some account of the Setupati, or Ramnad Poligan. Translated at Simoga, by C. O. RAMASWAMI. Ibid vol. iv. 20.
22. Chronological and Historical Account of the Modern kings of Madura. By MOOTIAH. Ibid. vol. iv. 4.
23. History of the Telugu Rulers of Madura. Translated by Mr. WHEATLEY. Ibid. vol. iv. 5-16.
24. Account of the Rajas who held the government of the Samsthan of Madura. By Vijaya Kumara-viswanatt Bhanganu Terumala Naih Gouroo; or, the representative of the family of Terumal Naih. Class 3, 82. clxxxxvi.
25. Account of the Colars. By MINAKSHI NAYAH of Madura. Class 3, 81. Ibid.
26. Account of Malanaudoo, and other places in the Calari country. class 3, No. 37. clxxxxiv.
27. Memoir of Tinnavelly. cxxii. vol iv. 2.
28. Raja Cheritra; or, History of the Princes of the South. Translated from the Tamil by SRINAVASIA.—*Journal of the Royal Asiatic Society, No. 6, p.* 199–242.

Supplementary Note to the Historical Sketch of the Kingdom of Pandya, by H. H. Wilson.

Shortly after the paper which the Royal Asiatic Society has thought worthy of a place in the present Number of the Journal, the Historical Sketch of the Kingdom of Pandya, was printed, I procured a copy of a valuable work recently transmitted to England from Madras, "Oriental Historical Manuscripts in the Tamil Language; translated, with Annotations, by William Taylor, Missionary." The most important of the manuscripts, now first published by Mr. Taylor, relate to the subject of my Sketch, and constitute materials highly essential to the elucidation of Pandyan history. The chief of them, the "Madura Sthala Purana," is clearly the same as one of my authorities, the "Madura Purana;" and it seems likely that the "Pandion Chronicle," and the "History of the Karnata Governors of Madura," which are also amongst Mr. Taylor's translations, may be identifiable with documents in the "Mackenzie Collection," of which I have made use.

There is, accordingly, a general conformity, as close, perhaps, as could be well expected between the details of Mr. Taylor's authorities and those which I have given; but his conclusions, and those which I have hazarded, do not always coincide. We are most at variance with regard to the chronology of Pandyan history; Mr. Taylor being disposed to assign to persons and events a much higher antiquity than I have ventured to ascribe to them. I am not about to vindicate my views: they are now more fully before the public than they were in the introduction to the "Mackenzie Collection," to which Mr. Taylor necessarily confines his observations; and some correcter notion also may be entertained of the particular authorities which I have taken as my guides. With the present Sketch, and the benefit of Mr. Taylor's translations and remarks, those who are inclined to decide between us are in a condition to form a judgment for themselves.

I should not, therefore, have thought it necessary to have adverted particularly to Mr. Taylor's publication, had it not comprised a statement which it is necessary to correct, that a candid comparison between our deductions may be instituted. Mr. Taylor observes in the preface to his second volume, referring to the notice of Pandya prefixed to the Mackenzie Collection: "One position, relating to the remote origin of the Pandion kingdom, being that to which the most decided objection was felt, as opposed to several authorities, having

been traced to its source, was found to have *no warrant or existence in the manuscript on which its authority was made to rest;* and there must, consequently, have been a mistake in the information on which Mr. Wilson necessarily depended, from his admitted want of acquaintance with the Tamil language." On this statement, I have, by the way, to remark, that the assumption of my depending upon "information," implying, it is to be inferred, verbal information, is gratuitous and mistaken. I trusted to translations—written translations alone; never to verbal information or interpretation. The translations were the work as frequently of European as of native scholars, as specified in the list attached to the Sketch; and in the instance of the authority on which my statement depends, was the performance of R. Clarke, Esq.

But, which is matter of more moment, Mr. Taylor's assertion, that the position is *without warrant or existence in the manuscript on which it rests,* is not only unsupported, but is even contradicted by the proof which he has himself adduced in a subsequent part of his work. The position to which he alludes is the statement, that according to some accounts, " the founder of the Pandya kingdom was one Pandya, a native of Oude;" and for this he says there is no warrant in the authority from which he supposes it to have been derived. All that he discovers in the text is, that in the manuscript " *Madura is merely said to have been founded by an agricultural Pandion from the north.*"* Such is his interpretation of the original and it is very possible that he may be correct; but, with such a passage actually in the original text, he is surely not justified in asserting, that there was *no* warrant nor existence whatever for the statement I had advanced, when, upon his own shewing, expressions so *very similar in their bearing do exist, and warrant, if not the precise words, yet a very similar sense.* Madura and the Pandya kingdom are essentially the same; and whether it was founded by a native of Oude, named Pandya, as I have it, or by an agricultural Pandion from the north, as Mr. Taylor states, does not appear to me to be so exceedingly different, that, where the latter occurs, it can be said that there is no warrant for the former. The difference, as far as it extends, appears to be that of translation; and the question of accuracy depends upon the relative competency of the translators. Admitting, however, that Mr. Taylor's version is correct, it does not follow that there were no traces whatever of such an interpretation as I have followed, and which, though not perhaps literally, is substantially the same with his own. Authorities may differ as to the period of this event, and its share in the establish-

* Historical Manuscripts, Appendix II. p. 39. Note.

ment of the kingdom of Madura; but their weight is in favour of a colonisation from Northern India. That "Pandya of Oude," or "a northern Pandion," had any personal part in the settlement of the country, is equally improbable.

I am too well pleased to see topics of this nature become the subject of discussion at all to take any exception to Mr. TAYLOR's arguments: our only chance of coming at the truth is by independent investigation, and a comparison of separate results. I have no purpose, therefore, to impugn his deductions; but I may be allowed to question the value of one of his authorities to which I think he ascribes more weight than it deserves. It is the manuscript in his first volume which he calls "The Supplementary Manuscript;" and which he regards as trustworthy.* I place no great reliance on any of the manuscripts which profess to record the ancient history of the Peninsula, especially in periods of remote antiquity; but there are greater sobriety, consistency, and air of likelihood in some than in others; and in those of the best description, there is a general conformity with each other, or with classical Hindu tradition, which indicates their having been compiled with some conscientiousness and care. The "Supplementtary Manuscript" possesses no such characteristics: it is exceedingly jejune and incoherent. In the first sections, the accounts which it gives of the connexion and intercourse between the Pandya princes of Madura, and the Pandavas of Hastinapura, although suggestsd by some of the adventures of Arjuna, as described in the *Mahabharata*, are wholly incompatible with the details found in that poem. The names of the first dynasty of Madura kings differ from those of every other list yet met with; and there is nothing in the meagre notices of them which gives them in a greater degree the character of realities. Twenty-four princes are enumerated as reigning from the beginning of the Kali age to the year 1183. To this dynasty succeeds VIKRAMADITYA, a prince whom all tradition places in the year of Kali 3044. Having thus so widely antedated the reign of VIKRAMADITYA, the compiler of this document is obliged to extend it in proportion; and, accordingly, it is made to continue until the year of Kali 3179, or nearly 2000 years. We then have the reign of SALIVAHANA for 990 years, and that of BHOJA for a century. In all this interval, or 3086 years, we have notice of only twenty-eight princes of Madura, and names of no more than five. Then commences a Pandya dynasty, in the appellations of the first of which, SOMA SUNDARA, and of his successors, we first meet with any agreement with other and more detailed accounts. Here then we may admit some approach to accuracy;

* Vol. ii. p. 75.

but for all that precedes, the "Supplementary Manuscript" is worthless. The best that can be said of it is that it is a blank, as five names are a very unsatisfactory provision for the record of 3000 years. Notwithstanding, therefore, Mr. TAYLOR's favourable opinion of the "Supplementary Manuscript," I cannot think that it is to be relied on for an insight into the dark periods of Pandya antiquity; and I am satisfied, that he will find at Madras, amongst the original manuscripts of the Mackenzie Collection, many documents much more worthy of his industry and acquirements.—*Journal of the Royal Asiatic Society, No.* 6, *page* 387—390.

2.—*Observations of the Magnetic Dip and Intensity at Madras.—By* T. G. TAYLOR, Esq. *H. C. Astronomer.*

Notwithstanding the value which has of late years been attached to observations of the Magnetic Dip and Intensity, I may, I believe, safely state, that the whole of British India has failed to put on record a single good set of experiments to this end. With a view to supply this deficiency for *Madras,* I have availed myself of the loan of a very excellent dipping needle, the property of Captain DRINKWATER, of His Majesty's ship *Conway;* and of two magnetic intensity needles which were brought out by the same officer, and are the property of Captain JAMES CLARKE ROSS, R. N. The dipping needle, which was constructed on purpose for the *Conway,* differs, I believe, in no respect from the ordinary construction, save that it is one of the best instruments I have met with, and, as far as I can see, absolutely faultless. The observations for Dip are as follows.

Observations for Dip made at the Madras Observatory, situated in Long. 5*h.* 21*m.* 7*s.* 8 *East of Greenwich, and Lat.* 13° 4′ 8″. 8 *N. on the* 26*th April,* 1837.

With Needle marked No. 1.

Face of Instrument E 2st.

No.	A.	B.	No.	A.	B.
1	7° 26′	7° 28′	2	6° 16′	6° 14′
3	7 6	7 4	4	6 12	6 8
5 Inverted the axis,	7 24	7 17	6	6 4	6 8
7	7 30	7 24	8	6 16	6 22

No.	A.	B.	No.	A.	B.
		Reversed the Poles.			
9	7° 28′	7° 22′	10	6° 34′	6° 38′
11	7 12	7 7	12	6 16	6 21
13	7 16	7 24	14	6 24	6 28
15	7 26	7 23	91	6 27	6 33
Mean,	7° 21′ 0″	7° 18′ 37″		6° 18′ 37″	6° 21′ 30″
		Needle marked No. 2.			
1	7 31	7 20	2	7 2	6 38
3	7 31	7 42	4	7 8	6 58
5 Inverted the axis,	7 42	7 25	6	6 55	6 14
7	7 50	7 30	8	6 45	6 55
		Reversed the Poles.			
9	7 24	7 6	2	6 0	6 21
11	7 26	7 4	4	6 10	6 28
13	6 34	6 44	6	6 15	6 0
15	6 34	6 43	8	6 23	6 4
Mean,	7 19 0	7 11 45		6 34 45	6 34 45

And taking the general mean, we get the true Dip

with Needle	No. 1	6 49 56	No.
ditto ditto	„ 2	6 55 4	
	Mean,	6 52 30	

N. B. The numbers 1, 2, 3, &c. exhibit the order in which the observations were made. During the present century, I cannot find that any observations for Dip have been made at *Madras*, but there is one result on record dated 1775, when Abercrombie found it to be 5° 15′ N.; if this result can be trusted, it would appear that the Dip is on the increase at the rate of 1′ 34″ in a year.

With regard to the needles employed for the magnetic intensity, it may be necessary to state, that they are constructed after the model of that of Professor Hansteen. The needles are cylinders, 2½ inches long and .3 inch in diameter, save that the ends are abruptly sharpened to a point; these needles are freely suspended on their centres by a few filaments of unspun silk, which are hooked on to a brass stirrup, moveable upon the needle; by which means a perfect adjustment to horizontality can be effected; the needle thus suspended is enclosed in a rectangular glass box immediately over a divided circle, from which the arc of vibration can be read off and the number of oscillations counted. The zero of measure here employed, is the time of performing 100 vibrations at a temperature of 60°, commencing with an arc of 20° and ending at from 2° to 4°.—If these measures could be observed to ulti-

mate accuracy, it would be worth while to reduce the times of vibration under these circumstances to the times of describing an infinitely small arc, as has been done by HANSTEEN, and on account of buoyancy, to a vacuum; but since such is not the case, the result will be obtained to all useful accuracy by supposing the correction common to each set of observations, by which the reductions, which are rather operose, are avoided: the reduction to a temperature of 60° is effected by applying the correction, 0,00017 t. (where t represents the time of performing 100 vibrations);—a formula which is derived from experiment. The two needles used in the following observations are distinguished from one another by a sign × on one of them. This needle in *London* at a temperature of 60° performed 100 vibrations in 442,76 seconds of mean time, whereas the other needle performed 100 vibrations under the same circumstances in 461,96 seconds; the former needle is further distinguished from the latter from its having been long in use in England, and as having exhibited a remarkable degree of steadiness in its magnetism during the late magnetical experiments instituted in Ireland under the auspices of the British Association; added to which, these needles are calculated to excite a more than ordinary degree of interest from the circumstance of their having been employed by Sir JOHN ROSS in the perilous North Polar Expedition, from which he has lately so fortunately returned. The observations at *Madras* are as follows.

No. 3, Private mark ×

1837	Arc.	Ther.	Vib.	Mean Time.	Interv.	Mean Int.
				h. m. s.	s.	s.
April 30th	20° 0	88.0	1	0 43 49.4	302.2	301.57
	12 45	——	101	48 51.3		
	8 15	——	201	53 53.1	301.5	cor. for temp. 1.43
	4 0	——	301	58 54.1	301.0	
						300.14
Another set.	20 0	88.0	1	1 1 49.0	302.2	301.60
	12 45	——	101	6 51.2		
	8 15	——	201	11 52.6	301.4	cor. for temp. 1.43
	4 15	87.8	301	16 53.8	301.2	
						300.17
May 3d	20 0	87.0	1	0 45 37.7	302.5	301.97
	12 45	——	101	50 40.2		
	8 30	——	201	55 42.1	301.9	cor. for temp. 1.38
	5 0	——	301	1 0 43.6	301.5	
						300.59

No. 3, not marked.

			h. m. s.	s.	s.
April 26th	20° 0′ 85.2	1	3 43 6.1	311.0	310.70
	12 30 ——	101	48 17.1		cor. for temp. 1.31
	9 0 ——	201	53 27.5	310.4	
					309.39
April 30th	20 0 87.8	1	1 25 17.3	312.1	311.50
	11 45 ——	101	30 29.4		
	7 30 ——	201	35 40.7	311.3	cor. for temp. 1.40
	4 0 87.3	301	40 51.8	311.1	
					310.10

or we have for the time of performing 100 vibrations at the temperature of 60° Fahrenheit at *Madras.*

Needle 3, ×	Needle 3.
s.	s.
300.14	309.39
.17	310.10
.59	
Mean, 300.30	Mean, 309.74

If h and h' represent the magnetic intensities at any two places, and T and T′ the times of performing 100 vibrations at those places, then we have

$$\frac{h}{h'} = \left(\frac{T'}{T}\right)^2$$

applying this, the horizontal magnetic intensity for *Madras* (that at *London* being assumed = 1.) becomes

	s.
By Needle No. 3, ×	2,1738
Ditto ditto No. 3,	2,2245

With a view to compare theory with practice, we might now compute the number of oscillations which No. 3 × ought to make at *Madras* from the observed number in *London;* thus, assuming the Dip for *London* to be 69° 10′ N. the formula becomes

$$\left\{3 + \sec.^2 (69° \ 10')\right\}^{\frac{1}{2}} : \left\{3 + \sec.^2 (6° \ 52' \ 30'')\right\}^{\frac{1}{2}} : : \overline{462,76}\,\Big\rceil^2 : T^2$$

performing the computation T = 344,87 differing to the amount of 44,57 seconds from the observations. This difference between theory and observation, is but one of many instances which have from time to time occurred in the infant state of a science. Observation has led us to a theory, and then again has shewn the incompleteness of such theory. In the case of Magnetism, we have long since been prepared to expect that local causes might considerably interfere with its esta-

blished laws; since one station (the island of *Teneriffe*) has already exhibited some singular anomalies, both in respect to the Dip and Intensity. Under these circumstances it is much to be wished that observations could be multiplied in various parts of India, whereby the law of variation from theory may be detected;—and how is this to be accomplished? My answer is ready:—Let any gentleman who is disposed to undertake a set of magnetic intensity experiments signify his intentions; and I shall have great pleasure in forwarding to him, free of expense, a magnetised and compared needle, provided that I am favored with a copy of the results. In anticipation that there will be several gentlemen disposed to forward this inquiry, I am now preparing several needles for use. All that is necessary is, that the person applying for a needle should be in possession of a good clock or chronometer, and has the means of ascertaining its daily rate.

Madras Observatory, 9th May, 1837.

Note.—We shall be most happy to promote the author's views by making a series of experiments with his needles in Calcutta, and then distributing them to friends in the interior. Of the dip we have a few records, (see Proc. As. Soc. for May). Major B. Blake also brought from England an adjusted intensity needle, but we have not yet been favored with his observations.—Ed.—*Journal of the Asiatic Society of Bengal, No.* 65, *May* 1837, *page* 374—377.

3.—*Report upon a Letter addressed by* M. le Baron de Humboldt *to His Royal Highness the President of the Royal Society, and communicated by His Royal Highness to the Council.*

To His Royal Highness the President and Council of the Royal Society.*

Previously to offering any opinion on the important communication on which we have been called upon to report, we feel that it will be proper to lay before the Council a full account of the communication itself. In this letter M. de Humboldt developes a plan for the observation of the Phenomena of Terrestrial Magnetism worthy of the great and philosophic mind whence it has emanated, and one from which may be anticipated the establishment of the theory of these phenomena.

* This report is taken from the Athenæum of March 1837.

After his return from the equinoctial regions of America, M. de Humboldt, in the years 1806 and 1807, entered upon a careful and minute examination of the course of the diurnal variation of the needle. He was struck, he informs us, in verifying the ordinary regularity of the nocturnal period, with the frequency of perturbations, and, above all, of those oscillations, exceeding the divisions of his scale, which were repeated frequently at the same hours before sunrise. These eccentricities of the needle, of which a certain periodicity has been confirmed by M. Kupffer, appeared to M. de Humboldt to be the effect of a re-action from the interior towards the surface of the globe—he ventures to say of "*magnetic-storms*"—which indicated a rapid change of tension. From that time he was anxious to establish to the east and to the west of the meridian of Berlin, apparatus similar to his own, in order to obtain corresponding observations made at great distances at the same hours, but was for a long period prevented putting his plan into execution by the disturbed state of Germany and his departure for France.

The Baron de Humboldt and MM. Arago and Kupffer having, by the co-operation of many zealous observers, succeeded in establishing permanent magnetic stations extending from Paris to China, M. de Humboldt solicits, through his Royal Highness the President, the powerful influence of the Royal Society in extending the plan, by the establishment of new stations. The plan which he proposes, and which has been successfully carried into execution over a large portion of the north-eastern continent, is, that magnetical observations, whether of the direction of the horizontal and inclined needles, or for the determination of the variations of the magnetic force, should be made simultaneously at all stations, at short intervals of time, for a certain number of hours and at fixed periods of the year, precisely similar to the plan which has been recommended and adopted by Sir John Herschel, with reference to observations of the barometer and thermometer.

Referring in terms of commendation to the magnetical observations which have originated in this country, M. de Humboldt expresses his wish that such observations may, by the adoption of an uniform plan, and by connecting them with the observations now in progress on the continent of Europe and of Northern Asia, be rendered more proper for the manifestation of great physical laws. He then enters into an historical detail of the establishment of stations for magnetical observations, stating the important results obtained by MM. Arago and Kupffer by means of simultaneous observations, which appear to establish the isochronism of the perturbations of the needle at Paris and Kasan, stations separated by 47° of longitude. Under the patronage of the Governments of France, of Prussia, of Denmark, and of Russia,

magnetical observatories have been established at Paris, at Berlin, in the mines of Freyberg, at Copenhagen, in Iceland, at St. Petersburgh, Kasan, Moscow, Barnoul at the foot of the Altai Chain, Nertschintk near the frontiers of China, even at Pekin, and at Nicolajeff in the Crimea.

M. de Humboldt states that the lines representing the horary variations at Berlin, Freyberg, Petersburgh, and Nicolajeff affect parallelism, notwithstanding the great separation of the stations and the influence of extraordinary perturbations; that this, however, is not invariable, since even at small distances, for example, at Berlin and in the mines of Freyberg, one of the needles may shew considerable perturbations, while the other continues that regular course which is a function of the solar time of the place.

The epochs at which it had been proposed that simultaneous observations should be made at all stations were,

20th and 21st of March,
4th and 5th of May,
21st and 22d of June,
6th and 7th of August,
23d and 24th of September,
5th and 6th of November,
21st and 22d of December,

From 4 o'clock in the morning of the first day, until midnight of the second, observing, at least hourly, night and day, at each magnetic station.

But as many observers have considered these as too near to each other, the observations most to be insisted upon are those at the times of the solstices and equinoxes.

England, from the times of Gilbert, Graham, and Halley to the present, observes M. de Humboldt, has afforded a copious collection of materials, adapted to the discovery of the physical laws which govern the changes of the variation, whether at the same place, according to the hours of the day and the seasons of the year, or at different distances from the magnetic equator, and from the lines of no variation. After adverting to the continued observations of Gilpin and of Beaufoy, omitting, however, to mention the important ones by Canton, he observes that the arctic expeditions have furnished a rich harvest of observations to Captains Sabine, Franklin, Parry, Foster, Beechey, and James Ross, and Lieutenant Hood;* and that thus physical geography is indebted to the attempts which have been made to discover the north-west passage, and also to the explorations of the icy coast of Asia, by Wrangel Lutke, and Anjou, for a considerable accession of knowledge on terrestrial magnetism and meteorology. Excited, he

* To this long list we may now add the name of Captain Bach; nor ought the name of Mr. Fisher to be omitted.

observes, by the great discoveries of Oersted, Arago, Ampere, Seebeck, and Faraday ; MM. Hansteen, Due, and Adolphe Erman have explored, in the whole of the immense extent of Northern Asia, the course of the isoclinal, isogonal, and isodynamic curves; and M. Adolphe Erman has had the advantage during a long voyage from Kamtschatka round Cape Horn to Europe, of observing the three manifestations of terrestrial magnetism on the surface of the earth, with the same instruments, and by the same methods which he had employed from Berlin to the mouth of the Obi, and thence to the Sea of Okhotsh.

M. de Humboldt remarks that our epoch, marked by great discoveries in optics, electricity, and magnetism, is characterized by the possibility of connecting phenomena by the generalization of empirical laws, and by the mutual assistance rendered by sciences which had long remained isolated. Now, he observes, simple observations of horary variation or of magnetic intensity made at places far distant from each other, reveal to us what passes at great depths in the interior of our planet or in the upper regions of our atmosphere : those luminous emanations, those polar explosions which accompany the "*magnetic storm*" appear to succeed the changes which the mean or ordinary tension of terrestrial magnetism undergoes.

M. de Humboldt considers that it deeply interests the advancement of mathematical and physical sciences that, under the auspices of His Royal Highness the President, the Royal Society should exert its influence in extending the line of simultaneous observations, and in establishing permanent magnetic stations in the tropical regions on both sides of the magnetic equator, in high southern latitudes, and in Canada. He proposes this last station because the observations of horary variation in the vast extent of the United States are yet extremely rare. Those at Salem, calculated by Mr. Bowdich, and compared by Arago with the observations of Cassini, Gilpin, and Beaufoy, may, he remarks, guide the observers in Canada, in examining whether there, contrary to what takes place in Western Europe, the (diurnal ?) variation does not decrease in the interval between the vernal equinox and the summer solstice.

In a memoir published five years ago, M. de Humboldt states that he has indicated as stations extremely favourable for the advancement of our knowledge, New Holland, Ceylon, the Mauritius, the Cape of Good Hope, the island of St. Helena, some point on the eastern coast of South America, and Quebec. In order, he observes, to advance rapidly the theory of the phenomena of terrestrial magnetism, or at least to establish with more precision empirical laws, we ought to extend, and at the same time to vary, the lines of corresponding observations ; to distinguish, in the observations, of the horary variations, what is due to the influence of the seasons, to a clear or a cloudy atmo-

sphere, to abundant rains, to the hour of the day or night, solar time; that is, to the influence of the sun, and what is isochronous under different meridians: we ought, in addition to these observations of the horary variation, to observe the annual course of the absolute variation of the inclination of the needle, and of the intensity of the magnetic forces, of which the increase from the magnetic equator to the poles is unequal in the American or Western, and in the Asiatic or Eastern hemispheres. All these data, the indispensable basis of a future theory, can acquire certainty and importance only by means of fixed establishments, which are permanent for a great number of years, observatories in which are repeated at settled intervals and with similar instruments, observations for the determination of numerical elements.

Travellers, remarks M. de Humboldt, who traverse a country in a single direction and at a single epoch, furnish only the first preparations for labours which ought to embrace the complete course of the lines of no variation; the progressive displacement of the nodes of the magnetic and terrestrial equators; the changes in the forms of the isogonal and isodynamic lines; and the influence which, unquestionably, the configuration and articulation of the continents exert upon the slow or rapid march of these curves. He will, he considers, be fortunate if the isolated attempts of travellers, whose cause he has to plead, have contributed to vivify a species of research which must be the work of centuries, and which requires at once the co-operation of many observers, distributed in accordance with a well-digested plan, and a direction emanating from many great scientific centres of Europe; this direction, however, not being for ever restricted by the same instructions, but varying them according to the progressive state of physical knowledge and the improvements which may have been made in instruments and the methods of observation.

In begging His Royal Highness the President to communicate this letter to the Royal Society, the Baron de Humboldt disclaims any intention of examining which are the magnetic stations that at the present time deserve the preference, and which local circumstances may admit of being established. It is sufficient that he has solicited the co-operation of the Royal Society to give new life to a useful undertaking in which he has for many years been engaged. Should the proposition meet with their concurrence, he begs that the Royal Society will enter into direct communication with the Royal Society of Göttingen, the Royal Institute of France, and the Imperial Academy of Russia, to adopt the most proper measures to combine what is proposed to be established with what already exists; and adds, that, perhaps, they would also previously concert upon the mode of publication of partial observations and of mean results.

M. de Humboldt finally refers to the labours and accurate observations of M. Gauss at the Observatory of Göttingen. The methods, however, adopted by M. Gauss being already before the Royal Society, in a memoir which has been communicated by him, renders it unnecessary here to enter into the explanation given of them by M. de Humboldt. He has referred to them in order that those members of the Royal Society who have most advanced the study of terrestrial magnetism, and who are acquainted with the localities of colonial establishments, may take into consideration, whether, in the new stations to be established, a bar of great weight furnished with a mirror should be employed, or whether Gambey's needle should be used: his wish is only to see the lines of magnetic stations extended, by whatever means the precision of the observations may be attained.

M. de Humboldt concludes by begging His Royal Highness to excuse the extent of his communication. He considered it would be advantageous to unite under a single point of view what has been done or prepared in different countries towards attaining the object of great simultaneous operations for the discovery of the laws of terrestrial magnetism.

Having very fully laid before the Council the contents of M. de Humboldt's letter, we have now to offer our opinion upon the subject it embraces. There can, we consider, be no question of the importance of the plan of observation which is here proposed for the investigation of the phenomena of terrestrial magnetism, or of the prospect which such a plan holds out of the ultimate discovery of the laws by which those phenomena are governed. Although the most striking of these phenomena have now been known for two centuries, although careful observations of them have within that period been made, and that still more care and attention have been bestowed upon those more recently discovered, yet the accessions to our knowledge, not only regarding the cause of the phenomena, but even with respect to the laws which connect them, bears a very small proportion to the mass of observations which have been made. This has arisen in a great measure, if not wholly, from the imperfection of the data from which attempts have been made to draw conclusions. Whatever theories may have been advanced in explanation of these phenomena, or attempts made to connect them by empirical laws; still, whenever comparisons have been instituted between the results of observation and such theories or laws, it has, in general, been doubtful whether the discrepancies which have been found might not as justly be attributed to errors in the observations, as to fallacies in the theory or incorrectness in the laws. Under these circumstances, the Royal Society, as a society for the promotion of natural knowledge, cannot but hail with satisfaction a proposition for carrying on observations of phenomena most interest-

ing in their nature and most obscure in their laws, in a manner that shall not only give greater precision to the observations, but at the same time render all the results strictly comparative.

There are, however, other grounds on which such a proposition as that made by M. de Humboldt should be most cordially received by the Royal Society. This society is here called upon, as a member of a great confederation, to co-operate with several other members, already in active co-operation, for the attainment of an object which ought to be common to all; and to such a call the Royal Society can never be deaf. Those who know best what has been done by co-operation on a well-digested system, and what remains undone in many departments of science for the want of it, can best appreciate the benefits that would accrue to science by the adoption of the extensive plan of co-operation advocated by M. de Humboldt. Independently of our acquiring a knowledge of the laws which govern the phenomena here proposed to be observed, we ought to look to the effect which the adoption of such a plan may have on other branches of science. The example being thus once set of extensive co-operation in a single department of science, we may anticipate that it would be eagerly adopted in others, where, although our knowledge may be in a much more advanced state than it is regarding the phenomena of terrestrial magnetism, still much remains to be accomplished, which can scarcely be effected by any other means. We might thus hope to see the united efforts of all the scientific societies in Europe directed to the prosecution of inquiry, in each department of science, according to the plan of co-operation best adapted for its development.

We must now, after these remarks on the general bearing of M. de Humboldt's communication, go somewhat into detail on points connected with it. One point of view in which we consider the proposed plan of great importance, and to which M. de Humboldt has not expressly referred, is this:—However defective ordinary dipping instruments may be considered to be, there are few persons who have had opportunities either of making observations with the ordinary instruments for determining the variation of the needle, or of comparing those made by others by the usual methods with such instruments, who will not admit that these instruments and methods are fully as defective—possibly much more so. Thus, however we may multiply the points on the earth's surface at which such observations may be made, still great uncertainty must always rest upon such determinations of these two important elements; and in all comparisons of such observations with laws, whether empirical or deduced from theory, it will ever be doubtful whether the discordances which may be found are due to errors of observation, or are indicative of the fallacy of these laws. This source of uncertainty must, in a great measure, if not wholly, be

obviated by observations made at fixed stations, with instruments of similar construction, which have been carefully compared with each other. And we have no hesitation in stating our opinion that more would be done in determining the positions of the poles of convergence and of verticity on the earth's surface, and other points most important towards the establishment of any thing like a theory of terrestrial magnetism, by simultaneous observations made at a few well chosen fixed stations, than by an almost indefinite multiplication of observations by the ordinary methods.

That a magnetic chart that should correctly exhibit the several lines of equal variation, Humboldt's "Isogonal Lines," would be of the greatest advantage to navigation, those who are best qualified to judge are most ready to admit. If to these lines were added the isoclinal lines, or lines of equal dip, the value of such a chart would, for the purposes of navigation in particular, be greatly enhanced. Whatever may be the magnitude of the influence of the iron in a ship on its compass needle, the extent of the deviation of the horizontal needle due to that influence, on any bearing of the ship's head, is a function of that bearing and of the dip of the needle at the place of observation. The extent, therefore, of the horizontal deviations, in various bearings of the ship's head, having been ascertained at any port where the dip of the needle is known, their extent at any other place, however distant, at which the dip is also known, may readily be calculated. Consequently, a chart which should correctly exhibit the isoclinal, in conjunction with the isogonal lines, would readily furnish the means of obtaining the correction to be applied to the ship's course by compass, both for the variation of the needle and for the deviation due to the ship's influence upon its compass. Whatever charts of this description may have already been constructed, and whatever materials may exist for the construction of more accurate ones, it is well known that great discrepancies exist among the data requisite for such constructions. And it appears to us that such a careful inquiry into the whole of the phenomena of terrestrial magnetism as is proposed by M. de Humboldt, is the means best adapted to insure the accuracy which would be of such inestimable advantage in this most useful application of scientific knowledge.

Although our views with regard to the stations proper to be selected for permanent magnetical observatories in general accord with those expressed by M. de Humboldt, we shall, we consider, be only conforming to his wishes, if we point out those stations which, from particular circumstances of position, appear most desirable. We consider that it would be of the greatest advantage if two or more permanent magnetical observatories were established in the high latitudes of North America, on account of the proximity of stations so situated at the

northern magnetic poles of convergence and verticity, whether these poles are two different points, or one and the same; indeed, continued observations at such stations would go far to decide this question, highly important in a theoretical point of view. M. de Humboldt has mentioned Quebec as a desirable station. To this place, and also to Montreal, we conceive that an objection exists, of which possibly M. de Humboldt is not aware; many of the houses in those cities are roofed with tinned iron. This objection may not, however, exist in some of the establishments in the vicinity of either of these cities. We consider that the most advantageous positions would be, one near the most northerly establishments in Hudson's Bay, and another at or near to Fort Resolution on Great Slave Lake. As, however, observers in such positions would be placed almost beyond the pale of civilization, we fear that, for some time at least, it would be found quite impracticable to obtain regular observations at these important stations. It would likewise be desirable that there should be a station in Nova Scotia or Newfoundland; the latter would be the preferable position.

If the government of the United States were to give their cordial co-operation to M. de Humboldt's plan, by the establishment of three or more permanent magnetical observatories, in different longitudes, these, with what we may expect to be undertaken by Russia in the extreme north-west, and our own establishments, would afford the means of obtaining a mass of more interesting magnetical observations than could perhaps be derived from any other portion of the earth's surface.

M. de Humboldt mentions New Holland, Ceylon, the Mauritius, the Cape of Good Hope, St. Helena, and a point on the east coast of South America, as desirable stations, and we fully concur in the propriety of the selection. Although Van Diemen's Land, from its greater proximity to the southern magnetic pole, would be a more advantageous position for magnetical observations than Paramatta, yet the circumstance alone of there being an astronomical observatory established at Paramatta, renders it peculiarly adapted for a magnetical station. Possibly circumstances may hereafter admit of magnetical observations being also made at Hobart Town, in conformity with the general plan which may be adopted.

The Island of Ascension, from its proximity to the magnetic equator, would possess peculiar advantages for a magnetical station; but these must, in a great degree, be counterbalanced by the nature of its soil, which, being wholly volcanic, would exert an influence on the needle that would render observations made there of a doubtful character; indeed, the same objection applies to St. Helena and most of the islands of the Atlantic. Some recent observations, those of Lieut. Allen, R. N., in the expedition up the Niger, would point to the

Bight of Benin as a desirable station; but the insalubrity of the climate and other circumstances prevent our recommending its adoption.

M. de Humboldt has not referred to any station in our West Indian colonies, but we consider that circumstances point to Jamaica as a station where it is very desirable that accurate magnetical observations should be made. It is generally considered that the variation there has, for a very long period, undergone but little change; and, on this account alone, it would be very desirable to ascertain, with precision, the amount of the variation, so that hereafter the nature of the changes it may undergo may be accurately determined. Its position also, with reference to the magnetic equator, is one which would recommend it as a magnetical station.*

Although M. de Humboldt has not adverted to any other point besides Ceylon in our Indian possessions, yet no doubt he would, with us, consider it desirable that observatories should be established at different points on the continent of India; and it appears to us that Calcutta and Agra are in positions well adapted for the purpose. As, however, there is an Astronomical Observatory established at Madras, there would be greater facility in obtaining magnetical observations there than at places where no such establishment exists.† We feel assured that the East India Company, which has shewn so much zeal and liberality in the promotion of scientific inquiry, and such a desire for the advancement of scientific knowledge in the extensive possessions under its controul, would afford its powerful assistance in the establishment of observatories for the investigation and determination of the laws of phenomena intimately connected with navigation, and, consequently, with the commercial prosperity of our country.

We consider, also, that Gibraltar and some one of the Ionian Islands are very desirable stations for the establishment of permanent magnetical observatories; and, to come nearer home, that such observatories

* Mr. Pentland, who has been appointed Consul-General to the Republic of Bolivia, having, since the Baron de Humboldt's letter was referred to us, offered his earnest co-operation in the objects contemplated in that letter, we cannot hesitate, now that this has been communicated to us, to recommend that an offer so liberal should be made available to science. If accurate magnetical observations were made at some station on the elevated table-land of Mexico, and simultaneously at another not very distant station, nearly at the level of the sea, we consider that they would determine points relative to the influence of elevation on the diurnal variation, the dip and intensity, respecting which our information is at present, to say the least, extremely deficient.

† It will be observed by the preceding article that the zealous Astronomer of Madras has needed no other incentive to carry on these investigations than the impulse of his own ardent mind. With a munificence highly creditable to a private individual, he has offered to supply the necessary apparatus to any persons willing to undertake a series of experiments, and we hope that by this means several magnetic stations will be established in S. India. Mr. Taylor is at this time on a scientific expedition to the southward, where he has appointed to meet Mr. Caldecott, Astronomer to the new Observatory at Trevandrum, to concert with that gentleman plans for the above purpose, as well as to make magnetic experiments on the route.—*Editor Madras Journal.*

should be established in the north of Scotland and in the west of Ireland.

M. de Humboldt adverts to another very interesting class of magnetical observations, those in the mines of Freyberg. The mines of Cornwall from their great depth, some being 1200 feet below the level of the sea, are peculiarly well adapted for observations of this description; and, from the spirit with which philosophical inquiry has been carried on in that part of England, we do not anticipate that much difficulty would occur in the establishment of a magnetical station in one of these mines.

Having enumerated the stations which by their position appear best adapted to furnish valuable results, and having likewise pointed out the facilities which some afford for the execution of this plan of observation, immediately that the nature of the instruments to be employed has been determined upon, and that such instruments can be provided, it may be proper to advert to stations where, although the same facilities do not exist, we consider that zealous and able observers might be obtained without much difficulty. We conceive that such is the case in Newfoundland, in Canada, at Halifax, Gibraltar, in the Ionian Islands, at St. Helena, and Ceylon; and we have authority for stating that there would be no difficulty in obtaining observers, in the Mauritius, and even at the Colony on the Swan River, the latter being a most desirable station. We have not alluded to the observatory at the Cape of Good Hope; if, however, no such establishment existed, the presence of Sir John Herschel would ensure co-operation there, in any plan calculated to advance scientific knowledge. Thus, altogether, there might be formed a most extensive spread of stations, in which the principal expense would consist in the purchase of the requisite instruments; and the means of establishing stations where the same facilities do not exist might afterwards be taken into consideration. As it would be necessary that, at all the stations, observations of the barometer, thermometer, and of atmospheric phenomena, should be made simultaneously with the magnetical observations, these would altogether form a mass of valuable meteorological information which it would be scarcely possible to collect by any other means.

There is one point in M. de Humboldt's communication on which we have not yet touched: the nature of the instruments best calculated to attain the objects in view by the establishment of magnetical observatories. This is a subject on which it will be most proper to enter fully when their establishment has been determined upon; and we would recommend that then the Committee should be appointed to investigate the subject, and that this Committee should report to the Council of the Royal Society what instruments they consider it would be most advisable to adopt at all the stations, and, at the same time, give in an estimate of the expense that must be incurred for

one complete set of such instruments. We may, however, in the mean time, offer a remark on one apparatus referred to by M. de Humboldt, that of M. Gauss. However well we may consider this apparatus to be adapted for the determination of the course of the regular diurnal variation, yet we apprehend that the great weight of the needles employed would prevent their recording the sudden and extraordinary changes in the direction of the magnetic forces, which are, probably, due to atmospheric changes. Another, and we conceive a very serious objection to this apparatus is, that bars of the magnitude employed must have an influence so widely extended, that there would be great risk of the interference of one of these heavy needles with the direction of another, especially in places where the horizontal directive force is greatly diminished, unless the rooms for observation were placed at inconvenient distances from each other.

By referring to M. de Humboldt's letter, it will be seen that the plan of observation so comprehensively conceived by him, has been most powerfully and liberally patronized by the Governments of France, of Prussia, of Hanover, of Denmark, and of Russia : indeed, it is quite manifest that a plan so extensive in its nature must be far beyond the means of individuals, and even of scientific societies unaided by the Governments under which they flourish. To suppose, even without the example thus held out, that the Government of this, the first maritime and commercial nation of the globe, should hesitate to patronize an undertaking, which, independently of the accessions it must bring to science, is intimately connected with navigation, would imply that our Government is not alive either to the interests or to the scientific character of the country, and would show that we had little attended to the history, even in our times, of scientific research, which has been so liberally promoted by the Government. Although the investigation of the phenomena of terrestrial magnetism was not the primary object of the expeditions which have now, almost uninterruptedly, for twenty years been fitted out by Government,—another of which, and one of the highest interest, is on the point of departure,—yet a greater accession of observations of those phenomena has been derived from these expeditions than from any other source in the same period. We therefore feel assured that, when it shall have been represented to the Government, that the plan of observation advocated by the Baron de Humboldt is eminently calculated to advance our knowledge of the laws which govern some of the most interesting phenomena in physical science ; that it appears to be perhaps the only one by which we can hope ultimately to discover the cause of these phenomena ; and that, from it, results highly important to navigation may be anticipated ; the patronage to the undertaking which is so essential to its prosecution will be most readily accorded. We beg, therefore, most respectfully,

but at the same time most earnestly, to recommend to His Royal Highness the President, and to the Council, that such a representation be made to the Government, in order that means may be ensured for the establishment, in the first instance, of magnetical observatories in those places which, from local or other causes, afford the greatest facilities for the early commencement of these observations.*—*Edinburgh New Philosophical Journal, April—July* 1837, *page* 316—330.

S. Hunter Christie.
9th June 1836. G. B. Airy.

4.—*Remarks on the Gamboge Tree of Ceylon, and Character of Hebradendron, a new Genus of Guttiferæ, and that to which the Tree belongs.*—By Robert Graham, m. d., *Professor of Botany in the University of Edinburgh.*†

There are, in tropical countries, many plants which yield a yellow juice, so nearly resembling Gamboge in external characters, and it is said, even in medical properties, that they have each obtained in their respective countries, the name of Gamboge Plant. These belong to exceedingly dissimilar families, their products are never exported from the countries in which they grow, and they are therefore known not to yield any part of the *Gamboge* of commerce. It has been much doubted, however, whether this is the produce of one plant only, and those Botanists who believe that it is so, differ in opinion as to what that plant is.

Modern Naturalists think this substance is obtained from a plant belonging to the Natural Family of *Guttiferæ*, and they generally differ only in believing, either with Murray, that this plant is *Stalagmitis cambogioides ;* or, with De Candolle, that it is *Garcinia Cambogia* (See *Essai sur les Proprietés Médicales des Plantes*, p. 105). Murray's opinions were founded upon certain MSS. by König, and the examination of a specimen collected by him, both of which were in the possession of Sir Joseph Banks, by whose liberality he was allowed to publish his observations, which appeared in 1789, in the ninth volume of the *Commentationes Societatis Regiæ Scientiarum Göttingensis.*

The Authors of the British and several of the Continental Pharma-

* We have not introduced the Baron de Humboldt's letter to the President of the Royal Society, because our space will not admit of it; moreover, the Report of M. M. Christie and Airy, together with their own admirable observations, gives a conveniently condensed abstract of it, which renders such a step unnecessary.—*Editor Madras Journal.*

† It will be observed by our 14th Number, p. 300, that Dr. Wight has been simultaneously occupied in the examination of this subject, and, in a paper published anteriorly to Dr. Graham's, has proposed a name for the plant yielding the Gamboge more unexceptionable, in our opinion, than *Hebradendron.*—*Editor Madras Journal.*

copeias, have adopted Murray's opinions; but in a paper, read to the Royal Society of Edinburgh, March, 1836, I stated my belief that this acquiescence had been somewhat too hasty; and my belief was founded on the examination of flowering specimens and drawings, with observations made in Ceylon, most obligingly communicated to me by Mrs. Col. Walker, and on the examination of a specimen in fruit transmitted by Mr. Blair to the late Dr. Duncan, now in the Materia Medica Museum of this University.

All the *Gamboge* of *Commerce* is exported, as it appears, from Singapore, and believed to be obtained from Siam. The observations of König were made in Ceylon, and during a short stay in Siam,—but chiefly at the former place, where his specimens must have been gathered; for Murray informs us that all his information in Siam was derived from a Roman Catholic Priest, who gave him a very imperfect description of the tree, and that König himself had never seen it alive, and had not even an opportunity of verifying the meagre description *(descriptio proletaria)* of his informant by procuring a single twig. Out of these materials, however,—viz., the said description, the observations of König made in Ceylon, and portions of a specimen in the Banksian Herbarium, transmitted from thence by König,—does Murray construct the character of his genus *Stalagmitis*, and define his species *cambogioides.* Murray's description is, in some respects, wholly at variance with the only tree which, in Ceylon, yields a matter having all the properties, and answering all the purposes of *Gamboge*; yet in Ceylon, as I have said (I presume from Murray's testimony), König's specimens must have been obtained. Indeed we have another authority than that of Murray for this belief; König himself gives his plant the Singhalese names of *Ghokkatu*, *Gokathu*, or *Ghotathu*, and *Kanna Ghoraka*, yet there is nothing so easy as to show that the description of *Stalagmitis* by Murray is inapplicable to this plant.*

The specimens which I possess of the Ceylon tree and its product, and the characteristic drawings with which these are accompanied, together with the information I have obtained regarding it, I owe entirely to the great kindness of my most intelligent correspondent, Mrs. Col. Walker; who, conjointly with her husband, is profiting with equal zeal, judgment, and success, by the ample opportunities which they enjoy of cultivating an acquaintance with the Botany of that rich and interesting island, Ceylon. It will give value and authority to these observations, if I make some extracts from Mrs. Walker's letters, in which the tree, in conformity with previously received opinion, is

* These observations regarding the origin of König's specimens, were written before I had the direct testimony of Mr. Brown. In a letter, dated Aug. 3, 1836, which I shall presently quote again, he writes, "*Stalagmitis* of Murray, as you well know, is entirely formed from König's MSS., and a portion of his specimens or rather of one of his specimens, and these specimens, as well as the descriptions, belong to the plant, of Ceylon."

called *Stalagmitis cambogioides*,—and I shall afterwards state what the tree really is.

In her first letter, dated Colombo, 1st July, 1833, Mrs. Walker says, "I have set about the *Stalagmitis cambogioides*, which is at present in fruit, and have drawn a branch, with a section of the fruit. I have likewise procured some Gamboge from the tree; it is brilliant and excellent. It is obtained from two other trees here, the *Garcinia Cambogia* and an unknown tree, which Col. Walker thinks is a *Garcinia* likewise. Specimens from both I shall send you, and drawings* also. The fruit of *G. Cambogia* is much used by the natives in their curries; and I am told, when quite ripe, is a very fine fruit, as large as the *Mangosteen*, which it resembles in form. The native name is *Goraka*. The fruit of *Stalagmitis cambogioides* is much smaller, very sweet when ripe, and by no means disagreeable in flavour. It is called here *Kana* (or eatable) *Goraka*. I have not yet ascertained all the uses made here of Gamboge, but it is certainly employed as a pigment by the native artists. Our servants say it is also used by native practitioners in medicine, and sometimes as a plaster, when first taken from the tree. It does not appear to exude like a gum, but on an incision being made, it issues freely through the pores of the bark, as I saw yesterday on cutting both the *Stalagmitis cambogioides* and *Garcinia Cambogia*. I have been trying it as a paint to-day, and find it as good as any I ever used.† We have no intercourse whatever with Siam, and I fear I can procure you no information from thence. I should think, from the specimen I have already got, that the matter which exudes from the *Stalagmitis cambogioides*, when an incision is made in the bark, is undoubtedly pure Gamboge. I have used it in colouring some of my flowers: it is quite liquid when it issues from the pores of the tree, but soon hardens when exposed to the air. I have not tried the stuff from the *Garcinias*, but it tastes and smells exactly like Gamboge."

Mrs. Walker's next letter is dated Aug. 20, 1834:—she says, "Your letter of February 1833, in which you first mention the subject of Gamboge, I received in June of the same year, and immediately inquired about the plant, which I found to be in fruit. In that state I drew it to the best of my abilities, but put off sending it to you till I had an opportunity of forwarding also, a representation of the flower, which, as many plants here blossom twice in the year, I hoped I might

* I have received excellent drawings of *Garcinia Cambogia* (Willd.), of *Garcinia Cambogia*, β. (Moon), and of the unknown plant alluded to, together with specimens of the two first, but none of the last, which seems a species of *Carallia*. R. G.

† In a note on the back of the drawing, Mrs. Walker says, "It issues from an incision in a thickish liquid state, and of a light yellow colour, but soon hardens when exposed to the air, and becomes of much deeper hue, and is perfectly fit for use in water-colour drawings, as much so as any I ever purchased, which was prepared and sold in the London colour-shops."

not have long to wait for. However, I was mistaken in this; the tree did not blossom till March, 1834. I drew it then, but have not since been able to send it home, not a single ship having sailed from hence to England during that long interval; and, I fear, after all, that you will consider my drawing incomplete, as it is only the barren flower I have had the means of representing. So at least it seems to me, and I got quantities of the blossoms, and examined a great number, and found them all the same. I shall send you specimens for your own examination; but I am sorry to say, they look very shabby and poor. The flower, however, in its best state, is insignificant, and poor-looking. The tree does not grow abundantly nor luxuriantly in the immediate neighbourhood of Colombo. Last January we took a little excursion, and got quite into a forest of *Stalagmitis cambogioides*, and perceiving all the trees had their bark cut off in various places, I concluded the people in the neighbourhood must be in the habit of collecting the gum, and determined to get all the information I could on the subject, for your edification. From a very intelligent native practitioner in medicine, I gained the following :—He told us that Gamboge from the *Stalagmitis*, called by the natives *Gokatu*, or *Kana Goraka*, is generally used by them, both as a pigment and medicinally. For the former purpose it is ground very fine with lime-juice,* and mixed with a pretty strong solution of the gum of the *Wood Apple* (*Feronia Elephantum),* called in Singhalese, *Diwul.* With the addition of a little Chunam, or Lime, they make a deep orange-colour, both tints being much used in the decoration of their temples, and Boodh himself is always represented in yellow garments. Yellow is indeed the sacred colour, the priests being invariably arrayed in yellow robes.

" As a medicine, the Gamboge is ground to a fine powder, and being mixed with the juice expressed from the leaves of the Tamarind tree, is taken with a little water. This is the most common mode of administering it as an aperient; but when mixed with other ingredients it is considered by native practitioners to be beneficial in many diseases. It is collected by cutting pieces of the bark completely off, about the size of the palm of the hand, early in the morning. The Gamboge oozes out from the pores of the bark, in a semi-liquid state, but soon thickens, and is scraped off by the collectors next morning without injury to the tree, the wounds in the bark readily healing and becoming fit to undergo the operation again. The learned doctor, who gave us this information, presented us with a large pot or jar of Gamboge, and

* In a recent letter to Dr. Christison, Mrs. Walker says that she finds this to be a mistake. As a yellow pigment, the juice is used without any preparation; the addition of lime juice injuring the colour—an observation which Dr. C. has confirmed by experiment.

promised to send us more, which promise he faithfully kept, and I shall forward specimens to you of his present by the first opportunity. The *Garcinia Cambogia*, of which I transmit you a representation, is one of the most common trees in this neighbourhood, attaining a large size, and is very handsome, with remarkably thick and dark foliage. A quantity of resinous juice proceeds from its bark, in the same manner that Gamboge does from the *Stalagmitis* ; but it never seems to harden thoroughly, and no use is made of it by the natives. The outer husk of the fruit, however, is a favourite ingredient in their curries. They prepare it by taking out the pulp and seeds, breaking it to pieces, and putting it in a heap, which is covered for two or three days, till it becomes soft. It is then smoked by burning cocoa-nut shells below the grating on which it is spread. This operation is continued for many days, when it is tied up tight in a bag, and kept for use by being hung, I cannot say in the chimney, for chimneys they have none,—but where it is under the influence of the smoke from their fires when cooking. They also use it in pickling or preserving, along with salt, a kind of small fish, which cured in this way will keep for six or seven months. The flower of No. 2, which I suppose is also a *Garcinia*, differs much from No. 1, but the fruit appears almost the same, and is used by the natives in the same way. They are indiscriminately called Goraka by the Singhalese, but are distinguished by their colour." *

In a subsequent letter, dated January 2, 1835, Mrs. Walker says, "I am convinced *Stalagmitis* produces true *Gamboge*. Dr. Pitcairn is of the same opinion, and desires me to tell you that he has administered it in the same way as it is used medicinally at home, and found its effects precisely the same."

I shall now state what the plant seems to be which is called by Mrs. Walker *Stalagmitis cambogioides*, and what are my reasons for forming the opinion which I entertain.

Linnæus, in his *Flora Zeylanica*, No. 195, under the name *Cambogia*, quotes as a synonym, "Carcapuli Acostæ, fructu malo aureo simili," of Plukenett's *Almagestum Botanicum ;* which, if it be the same as the twig figured by Plukenett in his *Phytographia, t.* 147, *fig.* 3, seems to me to be *Xanthochymus ovalifolius.*

In the same work, Linnæus also quotes, as a synonym of his Cambogia, the "Arbor Indica, quæ gummi guttam fundit, fructu acido sulcato mali magnitudine" of Commelyn's *Flora Malabarica*, which is certainly "Coddam-pulli" of Rheede in *Hortus Malabaricus*, *Mangostana Cam-*

* No. 1. I believe this to be *Garcinia Cambogia*, Willd., which is *G. affinis* of Wight and Arnott, certainly not of Wallich. No. 2 is probably a *var.* of *G. Kydia* of Roxb., perhaps his *G. purpurea ;* but as Roxb. gives no description of *G. purpurea*, the point cannot be determined. It is, no doubt, the *G. Cambogia* β., or Red Garcinia, of Moon's Catalogue. R. G.

bogia of Gærtner, *Garcinia Cambogia* of Desrousseaux and of De Candolle.

Linnæus lastly in the same work, cites as a synonym for his *Cambogia* "Carcapuli Acostæ, arbor Indica gummi guttam fundens, fructu dulci, rotundo, cerasi magnitudine," of Burmann's *Thesaurus Zeylanicus*, which, I think, is certainly *Mangostana Morella* of Gærtner *Garcinia Morella* of Desrousseaux and De Candolle, and, as certainly, *Stalagmitis cambogioides* of Moon's Catalogue of Ceylon Plants, and of Mrs. Walker; but by no means the "*Carcapuli*" of Acosta in his *Tractado de las Drogas*, p. 356; which seems to be *Carcapuli Acostæ* of *Pluk. Alm.* 81, *Garcinia Cambogia* of Desrousseaux.

It would probably be thought tedious and useless to follow the contradictions of authors regarding the identity of these plants, and that which yields Gamboge, from 1748, when the *Flora Zeylanica* was published, to the present day. I shall therefore pass them all over, until I come to the latest. In the excellent "*ProdromusFloræ Peninsulæ Indiæ Orientalis*," published by my friends, Dr. Wight and Mr. Arnott, in 1834, it is stated that *Stalagmitis cambogioides* (of Murray) is a species of Garcinia, and perhaps identical with *Garcinia Cochinchinensis* of Choisy, *Oxycarpus Cochinchinensis* of Loureiro. The whole of the account given by Murray of his *Stalagmitis* appeared to me, at the time I communicated my observations to the Royal Society, so enigmatical that I felt unable to form an opinion as to what it is; but I expressed my fears that the statement of Wight and Arnott only threw out another temptation to blunder; for Murray says, that in his plant, the flowers are arranged on a common footstalk, generally more than an inch long, in the axils of the leaves, jointed and bearing the pedicels, which are twice the length of the flowers themselves, in verticels at the joints, and that the fruit is globular, white, slightly reddened on one side, and sometimes twice the size of a large cherry; while Loureiro and Choisy describe their plant as having clustered nearly sessile flowers, with a pear-shaped reddish-yellow fruit, two inches in diameter. Wight and Arnott further say, that the *Stalagmitis cambogioides* of Moon is the *Xanthochymus ovalifolius* of Roxburgh; but Roxburgh describes his plant as having a three-celled ovary, a fruit as large as a small apple, while the genus is partly characterized by the flowers having five petals, and by the presence of five large truncated glands, alternating with the fasciculi of stamens. On the other hand, Mrs. Walker's drawings, and specimens of the fruit sent by Mr. Blair to Dr. Duncan, show that this, like the fruit of *Garcinia Morella*, is four-celled, and not larger than a cherry; and in the specimens which Mrs. Walker has sent to me, I never find more than four petals, and cannot see a trace of these glands. I only mention these circumstances now, to show the inextricable confusion in which the subject lay, and in which it would have remained, had it not been for Mrs. Walker and

the kindness with which Mr. Brown attended to my request that he would examine the specimens of König in the Banksian Herbarium. This examination has reconciled most of the contradictions of authors in a way which could hardly have been anticipated; the authoritative specimen of König is a compound, and consists of the flowers of *Xanthochymus ovalifolius,* with what seems the branch, leaves, and fruit of the plant which in Ceylon yields Gamboge. I give authority to this statement by quoting the letter of Mr. Brown. "The plant sent pasted by König to Sir Joseph Banks, as one specimen, I have ascertained to be made up of two plants, and very probably of two genera. The union was concealed by sealing wax. The portion in flower, and which agrees in structure with Murray's account, is, I have no doubt, the *Xanthochymus ovalifolius* of Roxburgh. *Stalagmitis* and *Xanthochymus* are therefore one genus, as Cambessèdes has already observed, giving the preference to the earlier name of Murray. This, however, forms but a small part of the whole specimen, the larger portion being, I am inclined to think, the same with your plant, of which I have seen, and I believe still possess, the specimen you sent to Don.* The structure, however, of this greater portion cannot be ascertained from the few very young flower-buds belonging to it. It approaches also very closely, in its leaves especially, to that specimen in Hermann's Herbarium, which may be considered as the type of Linnæus' *Cambogia Gutta.* A loose fruit, pasted on the sheet with König's plant, probably belongs to the larger portion, and resembles Gærtner's *Morella.*"

It appears then that the generic name of *Xanthochymus* must be dropped, and that the species which belonged to this genus must receive the appellation of *Stalagmitis.* It seems too, that the generic character of *Stalagmitis* by Murray, so far as regards the flower and inflorescence, was not taken from the plant he meant to describe, but from the flowers of *Xanthochymus* (*Stalagmitis*) *ovalifolius,* which König had inadvertently fastened to it; and lastly, that it is not known that any specimens of the flowers of the plant which Murray meant to describe, at least not any sufficiently perfect for examination, had been received in Europe, till those arrived which I owe to Mrs. Walker. The examination of these, proves that the plant is no *Stalagmitis.* It differs wholly in the number of the parts of the flower and cells of the fruit, in the structure of the calyx, corolla, and stamens; in the absence of intervening glands between the stamens, in the structure of the leaves, in the appearance of the fruit, and in the structure of the persistent stigma. While I remain quite certain that this plant is the *Garcinia Morella* of Gærtner, an opinion which was first formed from an inspection of the specimen in fruit from Mr. Blair, the examination of Mrs. Walker's specimens has induced me to remove the plant from the genus *Garcinia.* The structure of the stamens is quite

* One of those received from Mrs. Walker.

peculiar, and quite unlike that of any species of *Garcinia* with which I am acquainted, in which the free portion of the filament is thread-like, and the anther bilocular, opening longitudinally. In Mrs. Walker's flowers, on the contrary, the free part of the stamens is thick and clavate, and the anthers open by the complete circumcision of a singular umbilicate, flat, and terminal lid, the elliptical pollen-granules being immersed in cellular substance.

For these reasons, I cannot hesitate in believing that the Gamboge plant of Ceylon belongs to a nondescript genus, characterized especially by the stamens, which have suggested the name of *Hebradendron.* Having communicated this opinion to Mr. Brown, he replied, "In your plant, the structure of the anther is indeed very remarkable, and might well induce you to consider it as forming a distinct genus; but it is right to add, that approaches to this structure, and which serve to explain its analogy with the ordinary structure of the family, exist in *Garcinia,* with which I suppose your plant would agree in its female flower, as well as in fruit."

As I have never seen the female flower, nor any drawing of it, I cannot add to the probability which is given to this conjecture by Mr. Brown having formed it, except by stating, that there are within the persistent calyces of the fruit, abortive filiform stamens, very much resembling those which are found similarly attached to the fruit of *Garcinia.*

The resemblance to the Ceylon plant, of the inflorescence and form of the flower-bud, of *Garcinia elliptica (Wallich's List, No.* 4869), led me to examine its structure in connexion with this subject, and I found it also to have male blossoms, with stamens precisely similar. Sir W. J. Hooker was also struck with the resemblance, and obligingly forwarded to me his specimen for examination. His flowers were further advanced than mine, and on my requesting him to steep one, he sent me drawings which it is impossible to distinguish from those taken from the Ceylon plant. It is unfortunate that we do not know the female flowers in either species; and yet, if I do not misunderstand Mrs. Walker, or if she is not mistaken, which is less likely, the Ceylon plant is monæcious.

It is very certain that the tree of Ceylon yields a *Gamboge,* fit for all the purposes of that from Siam, and equal to it in quality, though from the process by which it is prepared for the market not being so perfect, its appearance is less attractive, and the price must be depreciated till that process is improved. At present, however, we have no direct testimony as to the tree which affords the *Gamboge* of Siam. Its being the same with that which in Ceylon yields this substance may be doubted. It is perhaps, and more probably, a nearly allied species of the same genus; this affinity appearing from the experiments of Dr. Christison, shewing all but an identity of chemical

composition in the product, and from their medicinal effects being precisely the same, as has been proved in Ceylon, and in this country, both by Dr. Christison and myself.

It seems probable, from some parts of the description in the *Flora Indica,* and the quality of the Gamboge yielded by it, that *Garcinia pictoria,* Roxb., may prove to be another species of this genus; but in this conjecture I must be wrong, if Buchanan is correct in considering this the same as *Oxycarpus Indica (Encycl. Method. Suppl.* 4. 257). I think, however, Buchanan is mistaken, for he deems it, at the same time, synonymous with *Garcinia Indica* of Choisy, and with "Arbor Indica Gummi guttam fundens," &c. of Burmann; while, in fact, the specimen in his Herbarium, from which he makes these references (No. 1118) is *Garcinia cornea.* The locality where *Garcinia pictoria* is found (Wynaad) being limited, and the tree having been, formerly at least, well known at Tellicherry, it is probable that specimens may be procured to ascertain the fact.

HEBRADENDRON.* *Graham.*

Nat. Ord. GUTTIFERÆ.—Class and Ord. MONÆCIA (or Diæcia ?) MONADELPHIA.

GEN. CHAR. HEBRADENDRON. *Flores* diclines. *Masc. Calyx* membranaceus 4-sepalus, persistens. *Corolla* 4-petala. *Stamina* monadelpha, columella 4-gona, antheræ terminales, operculo umbilicato circumscisso. *Fœm.* incognitus. *Bacca* multi (4) locularis, loculis monospermis, staminibus quibusdam abortivis liberis basi circumdata, stigmate sessile lobato muricato coronata. *Cotyledones* crassæ, coadunatæ. *Radicula* centralis, filiformis.—Arbores *foliis integris.*

1. Hebradendron *cambogioides;* floribus masculis axillaribus, fasciculatis; sepalis junioribus subæqualibus; foliis obovato-ellipticis, abrupte subacuminatis.

Synonyms.

Carcapuli Linscot, *Herman. Mus. Zeylan. p.* 26. *Ibid. in Rheed. Hort. Malab.* 1. 42. *in nota.*—Ray, *Hist. Plant.* 2. 1661. *Samuel Dale Pharmacop.* 327.

Arbor Cambodiensis Guttam Gambi fundens. *Pluk. Alm.* 41. *Ibid. Mantissa* 20.

Arbor Indica Gummi guttam fundens, fructu dulci rotundo, Cerasi magnitudine, Carcapuli Acostæ. *J. Burmann. Thesaurus Zeylan.* 27.

Cambogia Gutta. *Linn. Fl. Zeylan.* 87. *(excl. omn. syn. præter. Dale, Ray, Burm. Herm.) N. L. Burmann. Fl. Indic.* 119. *(excl. Syn. Pluk. et Rheed).*

Mangostana Morella. *Gært. Fruct.* 2. *p.* 106. *t.* 105.

Garcinia Morella. *Desrousseaux in Lam. Encycl. Method.* 3. 701. *Pers. Synops.* 2. 3. *Choisy in De Cand. Prodr.* 1. 561.

* From ἑβραιος δενδρον, in allusion to the peculiar dehiscence of the anthers.

Stalagmitis Cambogioides. *Moon's Cat. of Plants in Ceylon, Part I. p.* 73.

Descr. A *Tree* of moderate size. *Leaves* opposite, petiolate, obovato-elliptical, abruptly subacuminate, coriaceous, smooth, shining, dark-green above, paler below, veins in the recent state inconspicuous, especially above; in the dried state, distinct on both sides. *Flowers* unisexual, monæcious, (or diæcious?). *Male* small (eight to nine lines across), clustered in the axils of the *Petioles,* on short single-flowered peduncles. *Sepals* four, subequal, imbricated, concave, membranous, veined, the outer subentire, and somewhat coriaceous in the bud, the inner sparingly denticulato-ciliate, yellow on the inside, yellowish-white on the outside. *Petals* four, spathulato-elliptical, coriaceous, crenulate, longer than the calyx, yellowish-white, red on the inside near the base, deciduous. *Stamens* monadelphous; column four-sided; *Anthers* in a roundish capitulum, terminal upon a short clavate free portion of the *filament,* opening by the circumcision of a flat umbilicate lid; *pollen* yellow, granules elliptical. No trace of a *Germen. Female Flower* unknown. *Berry* about the size of a Cherry, round, with a firm reddish-brown external coat, and sweet pulp, four-locular, surrounded at the base by the persisting *calyx* and a few free abortive *stamens,* crowned with the four-lobed tubercled sessile *Stigma;* loculament single-seeded. *Seeds* large in relation to the berry, reniform-elliptical, compressed laterally, integuments yellowish-brown, easily separable into two layers; *Cotyledons* thick, cohering into an uniform cellular mass; *radicle* central, filiform, slightly curved.

Native of Ceylon.—For the colour and several other parts of the description, I am indebted to Mrs. Walker.

2. Hebradendron *ellipticum;* floribus masculis axillaribus, fasciculatis; sepalis exterioribus junioribus minoribus; foliis lanceolato-ellipticis, apice sensim attenuatis.

Synonym.

Garcinia elliptica. *Wall. List of Indian Plants, No.* 4869 (*not Choisy in De Cand. Prodr.* 1. 561).

I know nothing of this species, but from the specimens sent by Dr. Wallich to Sir W. J. Hooker's Herbarium and to my own. The specific character which I have drawn up, may therefore seem insufficient to distinguish it; and I might perhaps, have considered it only a *variety* of *H. Cambogioides,* but for the complete identity of form in the specimens from Dr. Wallich; their *prima-facie* difference from any of those received from Mrs. Walker; their considerably larger dissimilar leaves, and also their very different geographical position, less unlikely to possess natives of Siam than of Ceylon, Dr. Wallich's plants were obtained in Silhet.—*Companion to the Botanical Magazine, No.* 19, *page* 193—200.

Literary and Scientific Intelligence.

A correspondent at Ganjam has favoured us with the following notice :—

Ganjam, *30th June,* 1837.

A smart shock of an earthquake was felt here last night about ten o'clock. The ground was violently agitated, and the houses in the town shook so much that the inhabitants ran out into the streets in fright. I have not heard that any buildings actually fell. I send you this notice merely that you may compare notes with other accounts you will doubtless receive from other parts of the country, as so severe a shaking must have been felt a considerable distance.

With reference to the account of the operations at Pamban (see p. 111), we copy the subjoined extract of a letter from Lieut. Lake, of the Engineers, from the Madras *Herald :*—

" An English schooner yesterday (18th July) laden with iron and going to Negapatam, passed through the channel with a tolerable fresh breeze, and the main sail and jib set, in lieu of anchoring to the south and warping through as is customary. She did it at our suggestion as I was anxious to prove to them how easily they *might* do it—the Pilots were much against it. She did not take out a single pound of her cargo, and she drew close upon seven feet of water, and passed through an hour and a half before the tide had ceased flowing. A dhoney, drawing six feet, immediately followed her example, both with perfect safety, and never touched. This is I understand the first instance of an English rigged vessel passing through the channel with her sails set---certainly none have done so since I have been here---the depth is therefore considerably above the seven feet. Up to this date from the 1st, 500 tons of stone have been removed from the main channel."

An obliging correspondent at Malacca has forwarded to us a drawing of the Tapir (sent to the Asiatic Society of Bengal, by Lieut. Mackenzie, of the 48th Regt. M. N. I.) which gives a very correct delineation of that rare and singular animal. It is a female, of enormous bulk, upwards of four feet high. Several friends who saw the animal at Malacca say, that this drawing gives its contour and general characteristics most faithfully. This being the case, it follows that all the published engravings which we have seen require correction. The figure in the English edition of Cuvier, represents a comparatively light and agile animal, quite devoid of the heavy look, cumbrous figure and rugous skin, delineated in our drawing, and which all our inform-

ants say are peculiar characters of the Tapir. The eye is small and dull, the legs massy, the general appearance of the animal clumsy and unwieldy, and the skin about the throat and extremities in folds like that of the rhinoceros---in fact the creature seems to be a link in the pachydermata, between the rhinoceros and the hog.

It is in contemplation to publish an English and Hindustani Dictionary, if sufficient Subscribers can be found to cover the expenses. The work is by a Member of the Madras Civil Service: it is already in manuscript, and, in our next, we hope to be able to give further particulars, and to publish a specimen of the production.

We have received the following communication, and gladly afford it a place in this Journal, with a view to promote enquiry and elicit information on the very curious subject of Mr. Whewell's enquiries, which are exciting so much interest among scientific men in Europe :—

Dear Sir,—The Asiatic Society having been requested by its Patron the Rt. Hon'ble the Governor General, to draw the attention of those of its Members who may be resident within convenient distance from the Sea Coast, to the desiderata published by the Rev. Professor Whewell, in 1833, regarding the phenomena of the Tides, I have been directed to prepare the accompanying copy of the Professor's suggestions for circulation, and to address them to those of the Society's associates and correspondents, whose zeal in the cause of science furnishes an assurance that they will cordially co-operate in obtaining the information required.

As regards the tides of the Indian Ocean, the principal points to be ascertained are,—the exact times of the arrival of the tidal wave (i. e. the times of high and low water) at several stations on the East and West Coasts of the Bay of Bengal, simultaneously observed for one or more lunations—or if practicable for a whole year. If to this information can be added the *tide-lift*, or difference in perpendicular height between high and low water, obtained by means of a pier or a post set up for the purpose, the utility of the register will be much enhanced. The direction and velocity of local currents caused by the tide, with note of the prevailing winds and their action on the tides or the currents, will also be valuable additions.

It is particularly desirable to note the difference of the tide-lift in the two tides which occur within the same 24 hours, to serve as data for calculating what has been called the diurnal irregularity, a phenomenon

now discovered to be dependent on the declination of the moon north or south of the equator, but which has not hitherto been regarded in any of the published Tables of the daily tides, although the differences thus caused are of great magnitude, and are of material importance in the navigation of rivers and shallow seas.

In noting the time, it should be stated whether apparent, or true time, is intended; and if the time of the moon's passage over the meridian is mentioned, it will be a means of checking the rate of the clock.

Those gentlemen who may not be able to take observations themselves, from the situation of their houses or other causes, may frequently be able to instruct and employ a Classy or servant to note daily the most simple and essential points, the time and height of high water.

By way of ensuring results as comparable as possible, the months of July, October, January and April are selected, commencing with the new moon first occurring in each:—but it is by no means intended to restrict observations to these months, as any full period of a lunation will give information whence, what is called, "the tidal establishment" of a port may be deduced.

The Society has no intention of imposing a pecuniary tax on those who are willing to lend their aid in the prosecution of these enquiries; I am therefore directed to request that you will oblige me with a note of any trifling expense to which they may lead, relying, with confidence, on your judgment and discretion to effect the object as cheaply as possible.

I have the pleasure to remain,

Dear Sir,

Yours very faithfully,

J. PRINSEP,

Secretary.

ASIATIC SOCIETY'S APARTMENTS, *7th June,* 1837.

Suggestions for Persons who have opportunities to make or collect Observations of the Tides.

" It was shewn by Newton, nearly 150 years ago, that the fact of the Tides and several of their circumstances, resulted from the law of the Universal Gravitation of matter. But in this interval of time scarcely any thing has been done which might enable us to combine into a general view the phenomena of the Tides as they take place in all the different parts of the world; and a very few places have good and continued observations been made and published. It is conceived that by collecting such observations as have been made, or may easily be made, the connexion and relation of the Tides of all the parts of the Ocean may be in a short time clearly made out: and that persons

may be induced to make such careful observations as may serve to be compared with the theory. In this hope the present paper is circulated.

The most useful Observations with reference to our general knowledge of the Tides are the following, beginning with those which are most easily made.

1. The Observation of the Time of High water at a known place, on any day, and especially at new and full moon.

2. The Observation of the Time of High water on several days in succession at the same place.

3. The Observation of the Height of several successive Tides at the same place.

4. Observations of the comparative Time of High water on the same day at different places in the same seas.

1. An Observation of the TIME of High water at a given place on *any* known day may be useful.

If the Time of the *Moon's southing* on the same day be noted, this will facilitate the use of the observation, and will furnish an additional evidence of the correctness of the date.

The Time of High water on the days of *New and Full Moon* is more particularly useful than on other days.

Observations of the Time of High water may be made with sufficient accuracy without a tide-post. A place ought to be selected where the water is tolerably smooth.

2. If there be opportunity at any place, it is desirable to observe the Time of High water *every day for a fortnight.*

If it be ascertained that the two Tides on the same day occur at regular intervals, *one* of them only need be observed.

But there are often irregularities in the relative Times of the morning and evening Tide ; and these irregularities are different for different ages of the moon. In this case *both daily Tides* should be observed.

3. A single observation of the Height of the Tide is not of much value. But a *Series* of Heights *for a fortnight* is valuable, especially if accompanied with observations of the Times.

The morning and evening Tide are often unequal, and this inequality sometimes varies considerably from one fortnight to another.

In Observations of the Height of the Tide, the *difference of High and Low water* ought to be taken.

The channel of a river is *not* a good situation for such Observations.

4. The usefulness of Tide Observations will be greatly increased if those made at places in the same seas can be compared so as to shew the RATE *at which the Tide wave* TRAVELS :

For example, the time which it employs in passing along a certain line of coast, or across a sea, or round an island, or up a bay.

N. B.—The Tide wave is the elevation of the waters by which High water is produced in many places at once. It is not observed as a visible wave, but is found by drawing a line upon the globe through all the places at which it is high water at a certain moment. The rate and direction of its travelling are known by comparing the position of such lines at successive times.

N. B.—The Rate *at which the Tide wave* Travels is quite distinct from the rate at which the stream of ebb or flow *runs.*

N. B.—Also the Direction in which the Tide wave travels is quite distinct from the direction in which the Tide *ebbs or flows.*

The most proper Observations for determining the rate and course of the Tide wave are those of the Time of High water *on the same day at different points* (not too near nor too remote) on a continued line of coast or sea.

This may often be done by a person residing in any country by making enquiries of persons conversant with the coasts, or by directing corresponding observations to be made at different places for a few days only.

If the places differ much in longitude, this ought to be noted, that allowance may be made for the difference of the absolute Time of noon.

If there be any uncertainty as to the rate and course of travelling of the Tide between two places, the doubt may best be removed by obtaining Observations at some intermediate point or points.

It is necessary to distinguish the Time of High water at the *mouth* of a deep bay or sound, from the Time of High water further in. The former is to be taken in all such comparisons as are here spoken of.

Large islands and long promontories much disturb the regular progress of the Tide wave.

Comparative Observations of the *Height* at different places in the same seas, especially if combined with those of the Times, may also be of great value.

All communications concerning any Observations of the above kinds made or to be made in any part of the world will be thankfully received. They may be addressed to the care of the Sec. Asiatic Societies of Calcutta or Madras or direct to

The Rev. W. Whewell, Trinity College, Cambridge;
or, at the Royal Society, London;
or the Astronomical Society, London."

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY FOR THE MONTH OF APRIL, 1837.

Days.	BAROMETER AT Sun rise.	10 A. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10 P. M.	THERMOMETER AT Sun rise.	10 A. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10 P. M.	RAIN. Sun rise.	Sun set.	Evaporation.	DIRECTION OF WIND. Morning.	Noon.	Evening.	WEATHER. Morning	Noon.	Evening.
1837	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	o	o	o	o	o	o	o	In.	In	In.						
Apr. 1	29,938	30,010	29,968	29,904	29,896	29,906	—	80,7	84,6	85,0	84,6	84,0	83,7	—	...	...	...	S	S E	S	Haze F.C.	Th. hz.	Th.haze, lightning
2	,880	—	,918	,872	,872	,878	—	80,5	—	85,7	86,0	84,5	84,0	—	...	...	...	S W	S E	S E	Clear	Fl. cl.	Haze do. [of rain
3	,895	29,964	,952	,896	,874	,914	—	82,7	86,2	87,0	87,3	84,8	84,2	—	...	...	...	S	S	S E	Cloudy	Clear	Haze lg. few drops
4	,93.	—	,958	,916	,873	,916	—	81,0	—	86,3	87,2	84,7	83,9	—	...	...	...	S	S	S E	Clear	Clear	Haze lightning.
5	,933	29,982	,968	,904	,874	,924	—	80,6	84,9	86,0	86,2	84,2	83,3	—	...	...	5,072	S W	S E	S E	Th. haze	Clear	Haze dew do.
6	,916	,978	,962	,900	,872	,910	—	78,4	84,4	86,0	85,4	83,8	82,4	—	...	...	...	N W	S E	S E	Th. haze	Th. hz.	Haze do. do.
7	,882	,940	,970	,882	,858	,888	—	78,2	84,3	85,6	84,7	83,5	82,3	—	...	...	...	N W	S W	S E	Th. haze	Th. hz.	Clear do.
8	,856	,938	,912	,852	,850	—	—	79,0	84,1	86,0	86,3	85,2	—	—	...	...	...	S	S by E	S E	Th. haze	Haze	Haze do.
9	,894	—	,930	,874	—	—	—	80,6	—	86,2	86,7	—	—	—	...	...	...	S W	S E	S E	Haze	Fl. cl.	Haze lt.& driz. rain
10	,926	30,042	30,010	,960	29,936	29,954	—	82,8	79,7	78,0	80,5	80,9	80,5	—	1,534	...	...	S E	N	N	Cloudy	Rainy	Cly.th.lt.&hy. do.
11	,946	29,998	29,974	,934	,930	,970	29,992	76,5	81,4	83,8	84,3	83,5	82,9	82,1	...	...	...	N	S E	E	Th. haze	Haze	Clear dew.
12	,934	30,014	,984	,934	,920	,946	,968	78,4	83,8	85,8	86,0	84,0	83,4	82,2	...	...	—	W	S E	S E	Fl. cl.	Clear	Clear lightning.
13	,946	29,980	,950	,896	,876	,904	,926	79,0	84,3	86,0	86,9	84,8	84,0	82,4	...	...	...	S W	S E	S E	Haze	Clear	Clear dew.
14	,884	,930	,900	,848	,822	,849	,872	78,6	84,2	86,0	86,3	84,0	83,9	83,7	...	...	...	S W	S E	S	Clear	Clear	Th. haze dew.
15	,844	,892	,868	,816	,824	,862	—	79,8	84,3	86,7	87,4	84,3	84,0	—	...	...	...	S W	E	S E	Haze	Haze	Th. haze —
16	,884	—	,918	,884	,880	,924	29,954	82,2	—	85,3	86,0	84,0	83,2	82,6	...	...	...	W	S E	S E	Haze fl.cl.	Haze	Haze —
17	,900	29,972	,936	,850	,854	,894	,928	78,5	84,2	86,0	86,0	84,6	84,0	84,0	...	...	...	S W	S E	S E	Fl. cl.	Haze	Haze —
18	,882	,928	,910	,868	,844	,880	,912	80,5	85,2	86,5	87,0	85,1	83,9	83,5	...	...	...	S W	S E	S E	Haze	Haze	Clear —
19	,844	,896	,870	,808	,804	,834	,870	79,8	86,3	88,6	88,3	86,0	85,0	84 5	...	...	2,721	S	S	S	Clear	Clear	Clear —
20	,832	,874	,862	,800	,792	,798	,845	81,3	85,9	92,0	91,7	87,9	85,2	84,4	...	...	...	S W	S W	S W	Clear	Clear	Clear —
21	,818	,890	,850	,788	,778	,820	,872	81,7	88,2	92,0	89,7	86,8	86,3	85,6	...	...	...	S W	S E	S E	Clear	Clear	Clear —
22	,848	,920	,880	,830	,800	,828	,888	82,7	90,1	89,3	89,0	86,1	85,4	84,1	0,700	...	...	S W	S	S	Fl. cl.	Clear	Clear —
23	,992	30,020	,982	,948	,926	,962	30,000	82,3	86,0	87,5	87,5	85,8	85,4	83,9	...	...	...	N W	S	S	Cloudy	Clear	Clear dew.
24	,960	,036	30,024	,984	,946	,984	,006	80,0	84,8	86,5	87,0	85,6	85,3	84,4	...	...	...	S W	S E	S E	Fl. cl.	Clear	Ciear dew.
25	,958	29,996	29,980	,928	,920	,948	29,976	80,1	85,8	87,0	87,0	85,4	85,0	84,1	...	...	...	S	S E	S E	Clear	Clear	Clear dew.
26	,926	,980	,972	,924	,912	,952	,990	80,1	85,9	86,5	87,3	86,0	85,0	84,4	...	...	3,117	W	S E	S E	Clear	Clear	Clear ——
27	,932	30,006	,988	,932	,923	,970	—	80,3	85,8	87,0	87,6	86,3	85,1	—	...	...	...	W	S E	S E by E	Th.hz.F.C	Haze	Clear lightning.
28	,932	29,986	,970	,916	,904	,924	29,962	81,7	86,3	87,8	87,6	85,7	85,3	84,7	...	...	...	W	S E	S E	Fl. cl	Clear	Haze do.
29	,940	,992	,964	,906	,860	,884	,928	82,0	87,3	88,2	88,3	86,1	84,9	84,0	...	...	...	S W	S E	S E	Haze fl.cl.	Haze	Haze do.
30	,892	,920	,892	,852	,822	,868	,888	82,9	88,2	88,7	88,5	86,8	84,8	84,1	...	...	...	S W	S E	S E	Clear	Clear	Clear do.
Mean	29,905	29,965	29,941	29,887	29,870	29,903	29,932	80,4	85,2	86,6	86,8	85,0	84,2	83,8									

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY FOR THE MONTH OF MAY, 1837.

Days.	Barometer at Sun rise.	Barometer at 10 A. M.	Barometer at Noon.	Barometer at 2 P. M.	Barometer at Sun set.	Barometer at 8 P. M.	Barometer at 10 P. M.	Thermometer at Sun rise.	Thermometer at 10 A. M.	Thermometer at Noon.	Thermometer at 2 P. M.	Thermometer at Sun set.	Thermometer at 8 P. M.	Thermometer at 10 P. M.	Rain. Sun rise.	Rain. Sun set.	Evaporation.	Direction of Wind. Morning.	Direction of Wind. Noon.	Direction of Wind. Evening.	Weather. Morning.	Weather. Noon.	Weather. Evening.
1837	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	°	°	°	°	°	°	°	In.	In.	In.						
May 1	29,894	29,968	29,936	29,873	29,840	29,868	29,914	82,7	88,3	89,6	89,7	87,9	84,5	84,4				S W	S E	S E	Cloudy	Clear	Clear, litng.
2	,892	,960	,940	,882	,854	,878	,900	82,2	88,5	89,0	86,3	85,8	84,7	84,4				S W	S E	S E by S	Cloudy	Clear	Haze do.
3	,886	,962	,914	,872	,832	,880	,910	82,3	88,2	91,3	90,2	87,0	86,7	85,5			3,188	S W	S E	S S E	Clear	Fl. cl.	Cloudy do.
4	,886	,922	,898	,838	,808	,834	,876	84,7	89,7	88,8	88,5	86,7	86,2	84,4				S	S E	S E	Clear	Clear	Clear do.
5	,868	,928	,892	,832	,824	,864	—	82,7	89,3	89,3	88,7	86,8	86,0	—				S W	S E	S S E	Clear	Clear	Haze do.
6	,902	,976	,966	,920	,894	,920	29,966	82,9	87,8	88,4	88,8	86,1	86,0	84,8				S	S E	S E	Clear	Clear	Haze do.
7	,946	30,006	,986	,924	—	—	,970	82,7	86,1	86,7	87,1	—	—	84,0				S	S E	—	Th. haze	Th. haze	—— do.
8	,946	29,958	,942	,900	29,860	29,904	,924	81,0	87,2	89,5	89,2	86,4	85,7	85,0				S	S E	S E	Fl. cl.	Haze	Haze do.
9	,908	,948	,922	,874	,844	,904	,934	81,5	88,3	88,9	89,4	87,2	85,5	84,5				S	S E	S E	Clear	Clear	Haze do.
10	,908	,97[illegible]	,956	,904	—	—	,944	82,2	88,2	88,8	89,5	—	—	85,0			3,143	S	S E	—	Haze	Clear	Lightning.
11	,916	,970	,962	,948	—	—	,916	82,9	87,7	88,3	89,0	—	—	85,[illegible]				S	S E	—	Haze	Clear	do.
12	,896	,938	,950	,940	—	—	,908	81,9	86,4	88,7	89,0	—	—	85,7				S	S E	—	Clear	Clear	do.
13	,894	,930	,936	,926	—	29,890	—	82,2	87,7	88,7	88,8	—	86,3	—				W	S E	—	Haze fl.cl.	Haze	do.
14	,886	—	,916	,916	—	,884	—	84,0	—	88,2	88,3	—	85,6	—				S	S S E	—	Cloudy	Th. haze	do.
15	,862	29,908	,916	,910	29,886	,880	—	81,9	88,0	88,5	88,6	87,5	84,5	—				S W	S E	S E	Th. haze	Th. haze	Haze litng.
16	,862	,902	,908	,914	,900	,900	—	80,2	86,8	88,0	88,5	86,6	85,3	—				W	S E	S E	Haze	Clear	Haze do.
17	,884	,920	,928	,922	,898	,882	29,882	80,9	87,4	88,6	88,6	86,5	85,6	85,0			3,010	S W	S E	S E	Clear	Clear	Haze do.
18	,872	,902	,910	,906	,880	,874	—	81,9	87,3	88,8	89,7	86,5	86,3	—				W	E	S E	Haze	Haze	Cloudy do.
19	,854	,872	,884	,874	,854	,850	—	81,5	84,2	85,6	86,0	85,0	84,8	—				W	N E	E	Cloudy	Cloudy	Cloudy do.
20	,829	,860	,868	,854	,838	,832	—	82,9	84,8	86,0	86,2	85,3	85,0	—				W	N E	S E	Cloudy	Cloudy	Cloudy do.
21	,826	—	,858	,839	,815	,818	—	83,2	—	88,3	86,0	4,5	84,5	—				Calm	N W	S	Cloudy	Cloudy	Cl. do. thr.
22	,812	29,836	,845	,850	,838	,840	—	83,4	87,5	87,4	89,6	5,4	85,4	—				—	N E	N E	Cloudy	Cloudy	Cl. do. do.
23	,824	,858	,860	,860	,836	,832	—	82,3	88,3	89,3	88,5	5,3	85,3	—				N	N E	N	Fl. cl.	Cloudy	Fl.cl.do.do.
24	,838	,864	,866	,868	—	—	29,834	83,3	88,2	89,5	89,7	—	—	86,0			2,274	N	N E		Haze	Fl. cl.	Light. do.
25	,822	,856	,870	,87[illegible]	—	—	—	82,6	88,0	90,6	90,8	—	—	—				N W	N E		Haze	Fl. cl.	do. do.
26	,800	,822	,830	,800	29,840	—	—	83,9	83,1	83,3	78,0	5,2	—	—		2,457		N E	N W		Cloudy	Cloudy	do. do.
27	,800	,816	,826	,830	—	—	29,830	79,1	81,2	82,0	82,3	—	—	82,4	0,100			S S W	S W		Fl. cl.	Cloudy	do. do.
28	,812	—	,846	,814	—	—	,840	79,9	—	84,4	84,4	—	—	82,8				S S W	S W		Haze fl.cl.	Fl. cl.	do. —
29	,818	29,862	,870	,860	—	—	—	78,1	85,2	87,0	88,0	—	—	—				S S W	S		Clear	Clear	do. do.
30	,822	,852	,872	,878	—	—	29,854	80,3	85,9	87,8	89,2	—	—	84,2				S W	S W		Clear	Clear	do. do.
31	,838	,878	,886	,896	—	—	,866	82,2	86,2	88,4	90,6	—	—	85,6			3,202	S W	S W		Haze	Fl. cl.	do. do.
Mean	29,865	29,909	29,902	29,881	29,852	29,870	29,898	82,0	87,0	88,0	88,0	85,6	85,5	8,6									

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY FOR THE MONTH OF JUNE, 1837.

Days.	BAROMETER AT Sun rise.	10 A. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10 P. M.	THERMOMETER AT Sun rise.	10 P. M.	Noon.	2 P. M.	Sun set.	8 P. M.	10 P. M.	RAIN. Sun rise.	Sun set.	Evaporation.	DIRECTION OF WIND. Morning.	Noon.	Evening.	WEATHER. Morning.	Noon.	Evening.
1837	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	Inch.	o	o	o	o	o	o	o	In.	In.	In.						
June 1	29,854	29,882	29,892	29,902	—	—	—	82,3	86,8	89,0	90,6	—	—	—	... ...	... ...	... ...	s w	s w		Haze	Fl. cl.	Lightning.
2	,866	,888	,901	,910	—	—	—	84,8	88,3	90,4	94,2	—	—	—	... ...	... ...	... ...	s w by w	w		Cloudy	Fl. cl.	do.
3	,852	,890	,912	,906	—	—	—	86,4	88,6	92,0	94,0	—	—	—	... ...	... ...	... ...	s w by w	w		Cloudy	Fl. cl.	do.
4	,898	—	,930	,920	—	—	—	86,8	—	92,8	95,4	—	—	—	... ...	... ...	... ...	s w	w		Th. haze	Haze	do.
5	,868	29,897	,926	,912	—	—	29,890	86,0	89,8	93,4	91,2	—	—	85,7	... ...	... ...	... ...	s w	s w		Haze	Clear	do.
6	,882	,926	,944	,915	—	—	,886	83,0	89,8	92,6	91,7	—	—	85,7	... ...	... ...	... ...	s s w	s w		Clear	Clear	do.
7	,874	,922	,944	,926	—	—	,892	82,7	91,6	94,0	92,0	—	—	86,3	... ...	... ...	4,437	s s w	N w		Clear	Clear	do.
8	,880	,932	,954	,929	—	—	,900	84,2	90,7	94,0	90,7	—	—	85,8	... ...	... ...	... ...	w	N w		Th. haze	Haze	do.
9	,886	,930	,960	,936	—	—	,890	82,7	90,6	96,0	92,0	—	—	88,4	... ...	... ...	... ...	s s w	s w		Haze	Clear	do.
10	,880	,922	,930	,922	—	—	,890	84,6	90,6	90,5	90,3	—	—	88,0	... ...	... ...	... ...	N w	N E		Fl. cl.	Fl. cl.	do.
11	,884	—	,920	,918	—	—	,868	83,0	—	90,9	91,8	—	—	86,5	... ...	... ...	... ...	s w	s w		Clear	Clear	do.
12	,852	29,906	,912	,898	29,886	—	,880	84,1	92,3	92,0	90,6	88,6	—	86,0	... ...	... ...	... ...	s w	s E	s	Clear	Clear	Th. haze, litng.
13	,874	,906	,906	,894	—	29,903	,914	84,4	88,2	94,0	96,6	—	87,0	87,0	... ...	... ...	... ...	s w	w	s w	Clear	Clear	Cloudy do.
14	,890	,908	,900	,880	—	,913	,912	85,8	89,8	95,0	97,6	—	88,6	87,0	... ...	... ...	4,275	w	w		Cloudy	Clear	Lightning.
15	,894	,902	,898	,890	—	,902	—	84,3	88,2	92,1	95,5	—	88,0	—	... ...	... ...	... ...	w	s w		Clear	Clear	do.
16	,898	,910	,902	,881	—	—	29,848	84,6	88,4	93,2	96,5	—	—	88,0	... ...	... ...	... ...	w	w		Cloudy	Clear	do.
17	,892	,904	,890	,880	—	—	—	83,9	90,2	94,0	94,0	—	—		... ...	... ...	... ...	w	w		Haze	Haze	do.
18	,900	—	,844	,764	—	—	—	84,7	—	91,2	92,5	—	—	—	0,107	... ...	... ...	s w	w		Haze	Clear	do.
19	,794	29,832	,812	,790	—	—	—	85,2	90,0	93,0	96,0	—	—	—	... ...	... ...	... ...	s w	N w		Thick hz.	Cloudy	do.
20	,804	,856	,838	,800	—	—	—	86,2	88,3	92,0	92,8	—	—	—	... ...	... ...	... ...	s w	N w		Cloudy	Cloudy	do.
21	,854	,920	,900	,860	29,852	29,900	29,930	86,2	79,0	84,0	85,0	84,8	84,2	83,5	... ...	... ...	4,710	Calm	w	E S E	Cloudy	Cloudy	Cloudy, litng.
22	,886	,932	,922	,900	,848	—	,926	81,7	86,3	88,2	87,8	86,0	—	85,2	... ...	... ...	... ...	s w	s E	S S E	Clear	fl. cl.	Clear do.
23	,908	,952	,936	,908	—	—	,952	82,2	87,6	90,5	90,0	—	—	85,9	... ...	... ...	... ...	s w	N w		Clear	Clear	Thunder do.
24	,944	,968	,950	,908	—	—	,908	80,9	86,2	89,0	90,7	—	—	85,3	... ...	... ...	... ...	N w	N w		Clear	Cloudy	do. do.
25	,944	—	,920	,882	—	—	,906	81,7	—	90,2	92,2	—	—	85,8	... ...	... ...	... ...	w	N w		Haze	Haze	do. do.
26	,892	29,928	,908	,880	—	—	,904	84,2	88,3	92,0	91,6	—	—	85,9	... ...	... ...	... ...	w	w		Clear	Haze	do. do.
27	,872	,938	,922	,884	—	—	,890	83,7	84,3	87,0	88,4	—	—	81,0	... ...	0,077	... ...	s w	w		Fl. cl.	Cloudy	do. do.
28	,870	,912	,904	,872	—	—	—	79,8	83,9	86,3	88,5	—	—	—	... ...	... ...	3,165	s w	w		Cloudy	Cloudy	Lightning.
29	,874	,930	,914	,876	—	29,870	29,904	83,8	86,5	89,3	92,0	—	85,4	84,9	... ...	... ...	... ...	s w	w		Cloudy	Haze	do.
30	,876	,928	,906	,863	—	—	—	83,8	85,8	87,9	88,6	—	—	—	... ...	... ...	... ...	s w	w		Cloudy	Cloudy	do.
Mean	29,878	29,912	29,910	29,887	29,862	29,898	29,899	83,9	88,1	91,2	92,0	86,5	86,6	85,9									

The Instruments with which the foregoing Observations are made, are placed in the Western verandah of the Honourable Company's Observatory, at about 5 feet above the surface of the ground, and 27 feet above the level of the Sea; the Thermometer was made on purpose for the Observatory, and at 75° (the only point at which a comparison has been made) it was found to differ insensibly from the Royal Society's Standard;—the Barometer is one of two Standards which I have lately constructed, and may be depended upon to 0,01 of an inch.

Longitude.....5*h.* 21*m.* 8*s.* E.
Latitude......13° 4′ 85,″ N.

T. G. TAYLOR,
H. C. Astronomer.

MADRAS JOURNAL

OF

LITERATURE AND SCIENCE.

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I.—*Chinese Feast to Disembodied Spirits.*—By Lieutenant T. J. Newbold, *Aid-de-Camp to* Brigadier General Wilson, c. b. *Member of the Asiatic Societies of Madras and Bengal.*

The religious festivals of the Chinese are numerous, and specifically laid down by the board of religious rites in China. The sacrifices are divided into three great classes; the first and most important of which is subdivided into sacrifices offered to the azure heavens, to the earth, to the great abode of ancestors, and to the *Shay Tscih,* or gods of the land. The inferior sacrifices are offered to the planets, ghosts of great and good men, Confucius, the deities presiding over the elements, thunder, clouds, mountains, &c. Those which appear the most attractive in Chinese colonies are the *Yuen Tan,* on their new year's day; the feast of lanterns in the first moon; the sacrifices at the tombs, *Tsing-ming,* in the third moon; the feast of the dragon and *Quantai,* in the 5th moon, and that of *Shaou-e,* to the *manes* of their relations in the 7th moon.

The festival of *Shaou-e* commences on the 1st of the 7th Chinese month, and continues to its conclusion. Strictly speaking, the last fifteen days should constitute its duration. It is offered to the souls of the dead, which, during the month, are supposed by the Chinese to issue forth from the invisible world and visit their relations on earth. Supernatural noises, whisperings, and the rush of these aerial beings through the air, are pretended to be heard. It is said to have been instituted in honour of the descent of a mortal into *Hades,* who rescued his mother, as Orpheus endeavoured to rescue Eurydice, from Pluto's

drear domain. The sacrifice to the souls of the dead is of great antiquity in China. Confucius, in the *Chung yung*,* or golden medium, is stated to have declared that, "the man who was free from grief was *Wan Wang*—his father *Wang-ke*—his son *Woo Wang*. His father commenced the career of virtue, and his son continued it. *Woo Wang* continued the virtuous course of *Tae, Wang Wang-ke* and *Wan Wang*. He only once buckled on his armour and he gained the empire. His personal conduct was such, that he never lost his illustrious name in the empire. As to honour, he was emperor, and in riches, he possessed all within the four seas. He sacrified to his ancestors in the ancestorial temple, and his posterity preserved the empire.

Woo Wang, was in the decline of life when he received the appointment of heaven (i. e. the empire). *Chow-kung* perfected the meritorious deeds (or wishes) of *Woo-Wang*, paid royal honours to *Tae Wang* and *Wang-ke*, and sacrificed to their ancestors, according to the rites due to the emperor. He extended these sacrificial rites to the princes, great officers of state, literati and common people. If the father held a high office and the son was one of the literati, then he was buried according to the rites of great officers, and the subsequent sacrifices were those of the literati. If the father was one of the literati and the son a great officer, then his funeral rites were such as belong to the literati, and his sacrificial rites such as belonged to a great officer.

"'Confucius exclaimed, the filial piety of *Woo Wang* and *Chow Kung* is universally talked of.' 'In the spring and autumn they put in order the ancestorial temples, arranged in proper order the vessels of sacrifice; put the clothes of their ancestors on a person to represent them and offered the sacrifices of the season. By the rites in the temple of ancestors, are separated the different generations, according to their regular succession.' 'They served the dead as they did when they were alive, and those who are buried, as when they were with them. They served the Great Supreme by the sacrifices offered to heaven and earth, and offered the sacrifices of the ancestorial hall to their ancestors.'"

We gather from what has been said above, that sacrifices to the dead were offered in China so long ago as the time of *Wang Wang*, who is supposed to have flourished about the termination of the *Shang* dynasty, about 1112 years before Christ; and that they are considered by Confucius as necessary acts of religion or filial piety. They are

* The four books, p. 14, sec. xviii.

by no means peculiar to the Chinese; the Romans, we are told by Juvenal, offered sacrifices to the manes of their ancestors. It was an ancient custom among them to bury their dead in their dwelling houses. About which their spirits were presumed to hover for the protection of the living. The following notes on the Chinese feast to the spirits of the dead, as celebrated by the colonists at Malacca, were taken on the spot. The ceremonial will probably be found not to differ materially from that observed in the Celestial Empire, as the Chinese settlers, though not at all overburthened by a sense of reverence for their national religion, are remarkably tenacious of the pageants and festivals connected with it, and are moreover excessively superstitious. The number of these settlers in Siam, Cochin China, Tonquin, the Malay Peninsula, and the Islands of the Indian Archipelago is supposed now to amount to upwards of 800,000 individuals, all males. Those in our settlements in the Straits, Penang, Malacca and Singapore, I find, from censuses in my possession, amounted in 1835-6 to not less than 28,854 individuals, who emigrate principally from the provinces of Canton and Fokien. Though contrary, I believe, to the laws of China, emigration is connived at by the government, as it rids the country of paupers, a few of whom return to spend their hardly earned savings in their native provinces, thus creating a double benefit to the state. The prohibitions touching the emigration of the females are still rigidly observed, and have partly the desired effect of bringing back to their native country many wealthy individuals. If these interdictions were abolished, there is little doubt that our colonies to the eastward would be permanently filled by this active and busy people. The Chinese, in spite of their gambling and dissipated habits, are decidedly our most valuable class of subjects in the Straits. I have witnessed their activity in almost every situation, as artizans and mechanics, as navigators, agriculturists, cultivators of spices, miners of gold and tin, as merchants and shopkeepers, and have invariably found them superior, both physically and intellectually, to the Malays, Javanese, Siamese, and natives from continental India, among whom they have to struggle for a livelihood. Without further digression on this interesting subject, I will now return to my notes on the *Shaou-e*.

Riding out on the evening of the 1st day of the 7th moon, I observed crowds of Chinese in the streets, busily engaged in burning long strips of yellow and white paper, which formed a series of blazing piles, extending nearly the whole length of the street. They set fire to them with small tapers of red wax. These form the first offerings

and are supposed to pass into the invisible world as garments, &c. for the *manes*, who on this day are permitted to emerge from the gates of their shadowy abode, and visit their relatives on earth.

On the 15th day of the moon, I visited the *Quan-yin*, or temple, where the sacrifice to the spirits of the poor, and of such as have no surviving relations, is held. The place resounded with the clang of the deep toned gong, and the deafening clash of the Chinese cymbal. Within the walled enclosure surrounding the temple, a large platform was laid out with a number of dishes bearing conical heaps of boiled rice, adorned with slips of gaily coloured paper, shewing Chinese characters. The four angles of the platform were marked by columnar fabrics, constructed of bamboo and studded all over with Malay fruits—principally the *Sintol* and *Rambútan*, (*Nephelium Echinatum*). At the bottom rose a huge pyramid of plantains crowned with small flags. Behind this grinned ghastly the boiled corses of a flayed sheep and porker. Vessels, apparently containing their frothy blood, were placed before them. Nearer the temple stood another platform, bearing a table with the seats of the three *Wey-siong* or officiating priests. The inner door of the temple was shaded by the large leafy stems of sugar-canes, decorated with scalloped paper of a bright yellow hue.

In the street, in front of the principal entrance, I observed a third platform, about twelve feet high, illuminated by large tapers of red wax, the light of which was somewhat obscured by the clouds of smoke arising from burning incense. On the platform were ranged baskets of fruit and cakes; among the latter were some shaped like the human hand, divested of three of the fingers, small packs of Chinese cards, opium, and minute cups of porcelain, containing arrack. The baskets and dishes were surmounted by little flags. A table of great length, brilliantly lighted up, and covered with a variety of dishes of Chinese *cuisine*,* sweatmeats, fruit, &c. stood in the centre of the street. This formed the banquet intended for the expected aerial guests; for each of whom was placed a small cup of tea in the Chinese fashion, without either milk or sugar; one of hot arrack, a little plate of condiments, and a pair of gilt and red *kwae-tsze*, or chop sticks.

A personage called by the Malays, *Hantu Ribut*, the storm fiend, and by the Chinese *Tye-su*; a deity whose province it is to take charge of the souls of men, and to distribute the offerings, presides over the

* The custom of offering dressed meats to the spirits of ancestors was practised by Confucius. We find in the book of *Shang-lun* that when his prince presented him with raw flesh, he had it dressed and then offered it to his deceased ancestors.

banquet. He is represented by a black hideous image placed on a white pedestal covered with a Chinese inscription in black letters. The face, like that of *Mokanna,* was veiled. The covering was subsequently removed, as will be mentioned, from a visage frightful beyond description, black, covered with whitish blotches; a mouth of fearful dimensions, out of which was thrust a large red tongue. The head was large and covered with red shaggy hair. His apparel consisted of a black and gold vest, partially concealed by the folds of a red mantle thrown over his shoulders. A lion's head, painted green and white, adorns the idol's stomach. The legs are black and appear in all their naked deformity. The right hand grasps a banner on which appeared an inscription in Chinese.

At eight o'clock in the evening, the idol was brought forth with music and lights, and placed aloft on the platform last mentioned. The priests advanced to meet it, removed the cover from its face and* bowed down before it. This done they seated themselves at the table on the platform within the enclosure. On the table were placed four large red wax lights, a ritual, two small bronze bells, a vessel of water, two sceptre-like wands, two sticks slightly curved at the end, a small red slab, a cup containing rice, several small vessels, one of ashes, a sword, a red blossom of the *Siantan,* and vases of burning incense. A little after eight, five lay-officials made their appearance; the *Lochu* and four *Tao-kis,* who are the annually elected trustees of the temple fund. They were clad in their purple robes of ceremony, their tailed heads covered by conical caps, from the apex of which flowed a profusion of a substance resembling horse hair, stained crimson. They proceeded to the middle shrine, and afterwards to one of the side ones, where they performed adoration and offered incense. Shortly after this the three priests went through the same ceremony. The chief priest was a benevolent looking old man, clothed in a long brown robe and wearing a hat, not very dissimilar from that at present in use among the dignitaries of the christian church. They then adjourned to the table where the feast was prepared, and finally resumed their seats on the platform. The ceremonies commenced by the officiating priest producing five gilt portraits of the goddess *Hootchko,* to which five adorations were

* The Chinese forms of adoration consist in what they term the *pai, kwei,* and *kow,* bowing, kneeling and placing the forehead on the ground. They were in this instance performed consecutively; the priest bows his head towards the image, sinks on his knees; and from this last position, inclines his body forward, supporting its weight on the palms of the hands, until his forehead touches the carpet of prayer.

made ; as also to the vessel of her ashes, and to the water, as emblematic of the water of immortality. The ritual, which I believe is termed *Nanwaking*, was now opened, and a series of prayers read aloud by the chief priest in a recitative style : the termination of each of the prayers, or certain periods in them, was marked by his striking on the table with the red slab. The two inferiors assist in the service, marking the cadences in the chants, by instruments resembling castanets. At stated intervals the chief priest changed his robes for others of a different hue,* rang the bronze bells and sprinkled water, while the large gong of the temple ever and anon pealed forth a deep and sonorous note. The service was conducted with great solemnity, and reminded me of that of the Romish church. Its object, I understood, was partly to invoke the four spirits from the north, south, east and west, and to entreat them to assist in assembling the ghosts of mortals, wandering within their shadowy precincts to partake of the banquet prepared for them, and also to invite the ghosts themselves. This done the priest casts the divining *Keaou pei*† or *Shing keaou.* Should they turn up successfully twice out of the three times they are cast, the spirits are supposed to have accepted the invitation, and to have arrived at the temple. They are visible, if we can only believe our Chinese informants, to any person of faith, who will prepare his eyes for the sight by anointing them with the blood of a black sheep.

The high priest afforded his ghostly guests ample leisure to discuss the good things set before them, by continuing the prayers till nearly midnight. He then took out the sticks of incense, burning in the censers before him; and cast them, one by one, into the open space in front of the platform. The spirits are now presumed to have taken

* "The imperial high priest, when he worships heaven, wears robes of azure colour, in allusion to the sky. When he worships the earth, his robes are yellow to represent the clay of this earthly clod. When the sun is the object, his dress is red ; and for the moon, he wears a pale white. The kings, nobles, and a centenary of official hierophants wear their court dresses. The altar on which to sacrifice to heaven is round to represent heaven ; this is expressly said. The altar on which the sacrifices to the earth are laid, is square ; whether for the same wise reason or not is not affirmed. The "prayer-boards" *Chuh-pan*, are of various colours, for the same reason as the emperor's robes. In the worship of the heavens, a yellow ground is used with black characters ; for the worship of ancestors, a white ground is required with black characters ; for the sun, a carnation with vermilion characters ; and for the moon, a white ground with black characters."—*Art. on State Religion of China—Chinese Repository*, vol. iii, page 50.

† The *Keaou-pei* used, were small reniform bits of bamboo having one side convex, with an orifice through the centre.

their departure. The names of the contributors to the feast are read aloud, and on a signal given by the priest, the spectators make a rush at the table and carry off all the dishes they can lay hands on. The pillars of rice and fruit are precipitated to the ground, and the whole material of the banquet cleared off in an incredibly short space of time, by hands infinitely less ethereal than those of spirits. Hence this feast is termed by the Malays, *Sambayang Merrabût,* the plunder ceremony. The feast concludes by the burning of the images, paper-houses and mountains, gold and silver paper which are consumed in one large blazing pile, for the use of the departed spirits in the other world. According to an article in the Indo Chinese Gleaner, (II. 360). " The burning of paper (for a religious purpose) whether gilt or plain, of whatever shape, appears to have been adopted immediately after the abolition of human sacrifices on the death of *Che-kwang* (who died about 150 years before Christ), when he caused his domestics to be put to death to attend on him in a future state.* At present the consumption of paper which is annually used on all religious occasions, is very considerable, and forms an extensive branch of trade with the Chinese. The more usual offering is a piece of paper, about a foot long and eight inches broad, in the shape of the front of a bonnet, with a small piece of gold foil on its back; besides which they have representations of men and women, with various dresses, with houses, servants, boats, boatmen, &c. which are burnt and passed into the invisible state for the use of the deceased. Many well-disposed persons in China, allow the priests a certain sum monthly to offer up prayers, and burn the paper offerings for them; and wealthy people often employ men for the sole purpose of offering incense, burning paper offerings, and letting off fireworks on their festivals." The Chinese ordinary oath, as I have witnessed it taken in our Courts of Justice, consists in the person holding in his hand a slip of yellow paper, on which is inscribed an imprecation of divine wrath on his head, should he declare what is false. The paper is set fire to and burnt while retained in the hand. It, together with the inscription, is supposed by this process to pass into the other world and be there recorded.

* The Scythians, it is said, and some of the Tartar tribes, observed this horrid custom. In China, they anciently made bundles of straw in the shape of human beings, and in the time of Confucius, images of wood, which were interred with the dead. It is to this practice that Mencius alludes in the *Shang Mung* (page 6).

Besides the ceremony, just described at the temple, the private festivals of the different fraternities or *kongsis,* into which the Chinese enrol themselves, are held on the succeeding days of the month, in different quarters of the town; conducted by their respective *Lo-chus* and *Tao-kis.* As these are regularly subscribed for by the fraternity and consecrated to the *manes* of their departed relatives, no indiscriminate sharing of the remnants are permitted; each member carrying off at its termination the dishes he contributed, or is entitled to. The *Wey-siongs* or priests, attended and offered prayers and incense, first to the *Penates** and then to the spirits, who are presumed to be

* The household gods of the Chinese are generally a triad of deified mortals depicted on a large sheet of thick paper, which is suspended to the wall of the interior of their houses. Offerings of incense are made to them every day at sun-rise and sun-set, and of tiny cups of tea at the new and full moons. The vessels of ashes used at the funerals, about which the spirits of the deceased are supposed to hover, are placed on a small table in front of the picture. The principal figure in the group is that of *Quantai,* king of the west, who is represented in the painting from Canton in my possession as a portly middle aged person, with a rubicund visage garnished by a pair of sedulously cultivated *favoris* and mustachios. A scanty black beard descends from the tip of his chin down his capacious chest. He wears a purple tiara richly embroidered with gold, surmounted by a crimson ball. A white falling collar edged with blue, is fastened with a jewel round his throat. A red vest is almost concealed by a surcoat of light green, lined with pink, which descends to the feet and is emblazoned with the truculent heads of the imperial dragon in gold. It is confined around his ample waist by a red cincture, studded with precious stones, from which depends a long crimson tassel. Emerging from the folds of the robe on the left side, appears the *opou* or purse of red, green, azure and gold. The feet are protected by red slippers made after the Chinese fashion, with thick white soles, turned up at the toes, and ornamented with green and white He is seated on a throne of a dark reddish wood, over the arm of which hangs the skin of a lion. His left hand grasps one arm of the seat while his right plays with his beard. The right shoulder is ornamented with a richly embroidered badge.

The two other personages are subordinate in the group, and preserve a standing posture. The one on *Quantai's* right is a ferocious looking black, holding the *tat* of office, a sort of poll-axe, adorned with a red tassel, and inlaid with gold. From his right depends a green hilted sword furnished with a blue sword knot. His head is covered with a pink cap embroidered in gold, green, blue and white, a large gilded badge decorates the upper part of the right arm, and a straggling black beard descends on a blue edged, white falling collar. His robe is of various colours.

The figure on *Quantai's* left is frequently omitted. His name is *Wam-poa* and he seems to be the *Mantri* or prime minister, from his bearing the bag containing the imperial signet. His features are benignant and placid; his face fair and of the true Chinese expression, affording a striking contrast to the fierce Tartar countenance of *Quantai,* and the diabolical visage of *Chuchong.* His cap is of a fanciful shape, of various colours and richly embroidered with gold. A blue sash edged with white and gold, confines a plain red robe. The length of the finger nails of *Wampoa* and *Quantai,* imply a life of ease. The bag containing the signet is of a pale yellow, bearing a Chinese inscription in letters of gold on a pink ground.

present. The chief priest was on these occasions attired in dun coloured robes; the two others in purple, and carrying small bronze bells. These feasts terminated like that at the temple by a general conflagration of the images, paper, &c. for the use of the spirits. The *Lo-chu* and *Taokis* for the next year were then chosen in the following manner. The *Lo-chu* of the past year proceeded towards the painting of the *Penates* at the end of the room, and lighted several sticks of incense; steadfastly regarding the picture, he cast the divining bamboos, one from each hand, on the carpet, and pronounced at the same time the name of one of the candidates. Should the *keaou pec* turn up successfully twice, he is chosen—if not, the *Lo-chu* proceeds to cast them in the name of the next aspirant.

On the last day of the month, the feast to the spirits of orphan children took place at the temple with great display. The sweetmeat, fruits, &c. on the table were cut into a variety of fantastic forms, scorpions, rats, dogs and centipedes. In place of the hideous *Tye-su*, god of disembodied spirits, the image of a fair and beautiful female, the tutelary goddess of children, having a halo around her head, presides. Two children are represented standing before her. She, however, is doomed to the fire, and takes charge of the paper, houses &c. for the benefit of the infant spirits in the other world. The offerings were so numerous as to form a splendid funeral pyre; and at midnight the goddess sank into the curling flames, amid the clash of cymbals, the noise of gongs and bells, and the chanting of the prayers of the priests.

In the houses of Chinese drug-venders I found the pictures of *Quantai*, &c. replaced by those of a venerable sage holding a pencil in his hand. With this pencil, which resembles that used by the Chinese for the common purposes of writing, he is said to have effected the most miraculous cures. The druggist did not scruple to tell me a story of the celestial dragon himself, leaving his starry mansion for the purpose of consulting this Chinese Esculapius, on account of a disorder in his eyes, occasioned most probably by a whisk from the tail of a comet. In the foreground of these paintings, I observed one of the sage's disciples busily employed in extracting a bone from the throat of a tiger, who had been a little too precipitate in the process of deglutition.

II.—*A brief notice of some of the Persian Poets.*—*By* Lieutenant T. J. Newbold, *Aide-de-Camp to* Brigadier General Wilson, c. b.

(*Continued from No.* 15, P. 237).

Lutf Uddin Nishapúri.

لطف الدين نيشاپوري

Nishapúri was noted for the bad fortune which attended his whole career. *Mahomed Bukhtáwer Khan*, who relates the following anecdote of him, neither mentions the date when this poet flourished, nor gives any notice of his compositions, save a single stanza which is too much defaced, in the copy I possess, to be made out. Thus ill luck may be said to have persecuted him even beyond the dark inquisition of the tomb. But to the anecdote—"It is said that *Nishapúri* one day placed a number of pigeons, which he had taken considerable pains in collecting, together with a vessel of wine and a dish of the *pilau*, termed *mútanjen*, in a convenient spot in the garden, while he went in person to invite the object of his affections, to see the airy evolutions of the birds, and to partake of the good things he had prepared. In the interim some of his rivals scaled the garden wall, devoured the *pilau*, and washed it down with the wine. This done, they seized two of the pigeons, put them into the empty dish, and carefully replaced the cover. The poet shortly after arrived with his mistress, but on taking off the cover, was most disagreeably startled by the sudden flight of the pigeons from their *pilauless* prison. His rivals enjoyed the scene from a corner of the garden, where they had secreted themselves, while the disappointed lover cursed his unlucky stars; which, to use his biographer's words, although he was neither so great a villain as Pharaoh or Shedad, had played him so scurvy a trick."

Majid Uddin.

ماجيد الدين

Flourished in the time of *Atàbek Selgur Shah*, and was an intimate friend of *Khajeh Bhài-uddin Diwan*. He had a wife, both old and a shrew, whom he was at last constrained to run away from to Ispahan. The disconsolate spouse, like the old man in Sinbad, was not so easily to be shaken off, but followed his steps to the far-famed capital of *Iran*, with a perseverance sometimes to be met with in ladies of more

modern times similarly situated. One of *Majid's* pupils hearing of her arrival, thus maliciously congratulated his preceptor—" Good news. A lady has honoured (lit. descended on) your house to-day." On which *Majid* drily remarked, " It would have been better young man, had you brought me tidings that the house had descended on her."

Selgur Shah presented him on some occasion with a very costly robe, but of not very recent manufacture, having most of the words comprised in the *Kalimeh*, the Mahomedan confession of faith, embroidered thereon in letters of gold. The part deficient was the conclusion of the creed, viz. Mahomed Rassùl Allah, محمد الرسول الله Mahomed is the ambassador of God. Some of his friends on observing this, expressed their surprise at the omission of this very important article of their faith, when *Majid* pleasantly remarked, in allusion to the robe's antiquity, that he supposed it must have been fabricated before the time of the prophet.

Malek Kúmi.

ملک کومي

This poet travelled from Persia to the court of Nizam Shah in the Deccan; after whose death he held some lucrative appointment about the person of Ibrahim Adíl Shah. His compositions are said to comprise nearly a lac of couplets of no great merit. The poet *Zahùri* espoused one of *Kúmi's* daughters.

Malek Razi Uddin.

ملک راضي الدين

Was governor of *Bakr* in the reign of *Abaka Khan;* but for some misconduct was disgraced and the post conferred on the eunuch *Jelal Uddin*, on whom he penned a severe satire. He did not omit to make sarcastic allusion to his rival's bodily defects.

Malek Shah.

ملک شاه

Son of *Takhash*, a governor of Khurassan, was a poet of considerable talent. *Bukhtáwer Khan* does not mention the era in which he flourished.

Auhadi.

اوحدي

A celebrated poet, called also *Maregah,* flourished in the 7th century of the Hejira, and died about A. H. 696 at Ispahan, during the reign of *Gazan Khan,* son of *Arjun Khan.* His tomb is in the city, and is held in great reverence. His tutor, *Shaikh Shehab Uddin,* was a man of great piety, and was accustomed to recite after evening prayer the whole of the koran. *Maregah* thus brought up did not fail to make considerable progress in metaphysical studies. His biographer thus observes in palliation of his being a poet—" Although *Maregah's* elegant and playful disposition led him to the composition of poetry, yet the graver study of the mystic tenets of the *Súfis* was what engrossed his more serious attention; so much so that he accomplished the translation of the book *Jam Jam,* the Mirror of Sufiism, in the incredibly short space of a single month." The first sixty years of his life were passed in indigence and poverty; but finally, " the sun of his fortunes emerging from the clouds of obscurity that shaded its rise, set in glorious splendour and effulgence."

Mir Khosro.

میرخسرو

Flourished in the 14th century of the Christian era. *Khosro* is justly celebrated throughout the east for the purity and elegance of his style. He produced a *khamseh* in emulation of the celebrated composition, known under that title, of *Nizámi,* which it resembles both in subject and metre. The *Durya-i-abrar,* a mystic poem, is from *Khosro's* pen.

Mohammed Katebi.

محمد کاتبي

Or *Bin-Abdallah al Nishapúri,* was born at *Tarshiz* in Khorassan, whence he is sometimes termed *Tarshizi.* He resided at *Nishapúr* under the protection of *Sultan Mirza Ibrahim.* His works are numerous: among them is a poem on the loves of *Bahram* and the fair *Gùl-andám*—the *Kitab-i-Husn-wa Ishk*—the *Deh Báb*—the *Nasir-i-Mansùr*—the *Majina al Bahrain* and a *Medah* in praise of the Sultan, every verse of which terminates with the word *Gùl*—a rose. *Katebi,* while

reciting this ode was interrupted by the *Sultan's* suddenly demanding from him whence he came. The poet without the slightest hesitation replied to the monarch in the same metre in which he was then reciting,

همچو عطار ازگلستان نشاپورم ولے

خارصحرائے نشاپورم من وعطارگل

" Like *attar*, I come from the rose garden of Mishapùr,

But I am as a thorn of the desert,while *attar* is fragrant as the rose."

Katebi received ten thousand *dinars* for the ode. He bestowed the sum on the poor and indigent. The date of his death may be ascertained by the numerical value of the letters composing the following hemistich, viz. A. H. 886 :

مصرع

نماند کاتبی وماند ذکراو بجهان

Kàtebi remained not, but his name is everlasting in the world.

He is said to have been styled *Katebi* from the beauty of his handwriting. His *khamseh* is on the model of that of the celebrated *Nizami* (2 vol.).

Mohammed Shems-uddin Sózni

محمد شمس الدین سوزني

More familiarly called *Hukkim Sozni*, was descended from *Suliman Farsí*, one of the first companions of the prophet. Some writers aver that he was born at *Sámarcand*,—others, at *Nakshet*, and that having completed his studies at *Bokhàra*, he settled at *Samarcand*, where he died, aged 80 years, A. H. 569; according to *Mahommed Bukhtawar Khan* A. H. 566. *Sózni* was of a lively and agreeable turn of mind, and on this account his society was much sought after by the young and convivial. In their parties he gave free vent to those sallies of wit, for which he is so justly celebrated, and which sparkled in various impromptu repartees, both in prose and verse. He was a needle-maker, as his surname *Sózni* imports, and adopted this

handicraft in order to obtain easier access to a damsel, of whom he became passionately enamoured, under pretence of disposing of his needles. Towards the close of his career he retired from the world, in order to devote himself exclusively to the study of theology under the spiritual guidance of *Senai*, and other celebrated teachers. He commenced by performing the pilgrimage to Mecca, which his history tells us was accomplished after the most approved and orthodox fashion. In the subsequent penitentiary exercises he manifested great severity and self denial, and alludes to his sufferings in a *Diwan* comprizing 8,000 verses, wherein all that is touching and pathetic in Persian poesy has been employed to paint the anguish and remorse he felt for his sins. It is said that he appeared after death to one of his friends, and informed him that the Almighty's pardon had been extended to him, on account of the following lines, composed in the highest fervour of devotion:

قطعه

پادشاها من بدرگاهت پناه آورده ام
سر زراهت برده بودم رو برو آورده ام
چار چیز آورده ام شاها که در گنج تو نیست
نیستی و حاجت و جرم و گناه آورده ام

I have brought into thy presence, oh God! four things that are not in thy treasury, viz.—nothingness, poverty, sin and repentance.

Ruchi, a disciple of *Sózni*, wrote a quatrain on the occasion of his master's death, wherein he observes, in allusion to his surname *Sózni*, "every hair of my eyelids has become piercing as a needle to my eyes, since I can see him *(Sózni)* no longer; and every hair of my body as a thorn in my flesh, in that he is lost to me. Heaven now has nought for me, save the demonstration of its wrath."

One day the poet *Fazli* found *Sózni* in an assembly of literary men, with a face much inflamed in consequence of a controversy he had entered into with one of his friends. *Fazli* enquired with some astonishment what was the reason of so great an alteration in his looks; *Sózni*, moved by the brusque manner in which the question was put, retorted on his interrogator, who happened to possess a countenance the very reverse of beautiful, "The moment I saw you, my sins came

into remembrance and I blushed through very shame." *Fazli* replied, "Why should the sight of me bring your crimes to mind?" *Sózni* rejoined, "I feared lest God as a punishment for them might make me as hideous as you are."

Jeláli, another poet gifted with a nose of surprizing length complained one day to *Sózni* of his having conferred on him the *soubriquet,* "*Kher-i-serkhom-khaneh*"—the ass of the wine cellar; but added that he was not at all vindictive and knew how to bear insults without resentment. *Sózni* pleasantly replied that this patient disposition of his was sufficiently manifest to all the world, seeing that he had borne for 40 years a nose so long and incommodious. Herbelot cites an epigram on this subject written by *Sózni* to the following effect: "Thy immeasurably long nose is a burthen to every one, for it is thrust every where without the slightest discretion. I am well convinced that when thou prostratest thyself it is less for the purpose of devotion, than to disencumber thyself of the weight of a burden alike insupportable to its possessor and to others."

The author of the *Tarikh-i-Guzideh* observes that *Sozni* was also called *Abu Bekr al Beláli,* and dwelt at *Kilas,* a dependancy of Samarcand. *Mahomed Bukhtawer Khan* states that he obtained the appellation of *Sozni* from his affection for the son of a needlemaker. He cites the following couplet as the *Matla** of the ode in which *Sózni* craves divine mercy.

بیت

تا کی زگردش فلک آبگینه رنگ

برآبگینه خانهٔ طاعت زنیم سنگ

"How long through the revolution of the mirror-like heavens shall we continue to cast stones on the crystal mansion of self restraint!" The date of his death is A. H. 566 as appears from the numerical value of the letters composing the following words calculated agreeably to the *Abjad.*

سوزني فحاش دم

* For the explanation of *Matla,* vide Essay on the metrical compositions of the Persians (Journal No. 14, p. 116).

Moulana Maruf.

مولانا معروف

Cotemporary with *Secunder Mirza*, governor of Shiraz, in whose presence he composed and wrote down, between sunrise and afternoon prayer, one thousand five hundred distiches, for which he was munificently rewarded by the *Mirza*. *Maruf* was remarkable for generosity and his beautiful penmanship.

Muazzi.

موزي

A poet in the service of *Muaz-uddin Malek Shah ;* hence his appellation. *Muazzi* had an excellent memory, and could repeat an ode of considerable length after having heard it only once recited.

Mustoufi Ahadi.

مستوفي احدي

Ahadi was born of a good family in the town of *Sabzwar* in Khorassan. Among his compositions is a *Medah*, in praise of *Imam Ali Bin Mússa-ar-Reza*. He possessed considerable knowledge in physic and astronomy.

Najib Uddin.

نجيب الدين

Was the encomiast of *Kila Wesak*. He died towards the conclusion of the Seljukian dynasty and is better known under the title of *Jer Badkani*.

Najm Uddin.

نجم الدين

Flourished during the reigns of *Abaka Khan* and *Arjum Khan* his son. He followed the trade of a goldbeater and was accounted a good poet. The following lines are cited by his Persian biographer as a specimen of his style :

نظم

مذم زرکوب ماحصولم بصنعت
بجز فریادے و بانگم نبا شد
همیشه در میان زر نشینم
ولیکن هرگزم دانگی نباشد

I am a goldbeater, and earn my bread by my trade;
But cannot get on without clamour and noise,
Though always seated in the midst of gold
I have not a *dank** to call my own.

Màmi Mir Mahomed Màsum.

نامي مير محمد معصوم

This poet was a noble of *Bekr* and one of *Akbar's* courtiers. He was sent on an embassy to Persia, and on the journey amused himself by cutting verses of his own composition on the pillars and mosques where he halted. The following lines of his are cited:

بيت

چون گریهٔ من دید نهان کرد تبسم
پید است کزین گریهٔ من بي اثر نسيت

"When she saw my tears, her smiles vanished, and it became evident that my weeping was not lost upon her."

Nàsiri Hamdàni.

ناصري همداني

Hamdàni, lived in the reign of *Jehangir*, and is said to have excelled all his cotemporaries in beauty and melody of language. He com-

* The *dank* is a small coin valued at the sixth part of a *direm*.

posed a *Diwan* considered as the "model of eloquence." He shone also in epistolary composition.

Nàsir Khosro.

ناصرخسرو

A poet, physician by profession, cotemporary with *Sultan Mostanser Fatimi Mughrebi,* caliph of Egypt, flourished in the 5th century of the Hejira—*Khosro* was profoundly read in the doctrines of the *Shías* and his opinions on religious subjects were implicitly bowed to by those of his own sect. His poetical compositions are but faintly praised. The name of one alone is mentioned by his biographer, viz. the *Roshnai námeh.*

Náziri Nishapúri.

ناظري نيشاپوري

Nishapúri was liberally patronized by the emperors *Akbar* and *Jehangir.* He was more lauded for his generosity to mendicants and faquirs than for poetical talent.

Newái.

نوادي

Also called *Mir Alishir,* is the author of a *Diwan* written in the Persian and Turkish languages. He composed an ode in answer to the *Bahr-al-abrar* of *Mir Khosro.* *Newái* was a man of wealth, famed for generosity and his munificent patronage of poets and men of letters.

Nevidi Nishapúri.

نويدي نيشا پو ري

This poet was a native of *Nishapúr* as his title imports. He entered into the service of the emperors *Humaiyún* and *Akbar,* in praise of whom he composed numerous *medahs.* He died A. H. 973 and was interred at the city of *Ajin.*

Nezári Kohistan.

نظاري كوهستان

Kohistan excelled in compositions on wine, in its mystic signification. He lived in the reign of *Akbar.*

Nizámi Wrózi.

نظامي عروضي

Namesake and contemporary of the celebrated *Nizámi,* author of the *Majma-un-nuwádir,* collection of wonders. The *Sultan Toghral* one day asked *Wr ózi* whether there was not another poet named *Nizámi.* He answered that there was, and in an extempore stanza confessed his own inferiority.

Nizámi.

نظامي

Or *Sheikh Nizámi Gangiah,* a celebrated poet, lived during the reign of *Sultan Toghral Bin Arselan Seljùki,*in the 6th century of the Hejira. He was the author of five very justly celebrated poems, entitled, collectively, the *Khamseh,* from the Arabic word *Khams* خمس five ; in imitation of which those eminent poets, *Mir Khosro, Hátifi, Kátebi* and *Jámi* composed theirs.

Of these the *Makhzen-al-asrar* is a poem on ethics and the doctrines of the *Súfis.* The *Shírín-wa-khosro,* the *Leila wa majnún,* the *Herft Paiker,* are all love tales well known in Persian poesy. The fifth and last is the *Secunder* or *Sheref Nameh,* the history of Alexander the Great, a poem of great merit. It commences with the narration of his birth and education under *Nikermas,* father of *Aristo,* or Aristotle, and goes on to relate in successive chapters his victories over the armies of *Rúss* and *Zangbar* (an island supposed to be in the Indian seas)—the construction of his famous mirror—his victory over the Persians under *Dára,* Darius, and the death of that monarch—the destruction of the temples of the Magi or fire-worshippers—his visit to the *Kaabah,* and to the cave of *Kai-khosro;* who, according to Sir William Jones was the Cyrus the Great of the Greeks—his expedition to India and China—his subsequent wars with the armies of Rúss; and

finally his travel to *Zulmet* (a dark region at the extremity of the world where the fountain of life is supposed to exist) in quest of the water of immortality, from which he returns without success.

Part the second is called the *Fal Námeh* and is probably the same, alluded to by Mr. Ousely, as the "sixth poem," sometimes added to the "five treasures of *Nizami*." It contains an explanation of the title usually applied to Alexander by Oriental historians of *Zu-al-karnein*, Lord of the two horns—the story of Arasmandas of the *Kibti*, or Coptish woman &c., the coronation of Alexander, his question to *Aflatun* or Plato. The council of the seven sages, viz. *Aristo, Wales, Balinas, Socrat, Furfuriùs, Hermas, Aflatun.* Their opinions and those of Alexander and *Nizami.*

Alexander imagines himself a prophet, and receives letters from *Aristo, Aflatún* and *Socrat.* He proceeds to the west of the land and arrives at the city of *Peristan,* fairy land. His second expedition to India and China; he falls sick on his return, makes his will, and writes to his mother and dies, succeeded by his son *Askanderùs* supposed to be the Aridœus of the Greeks.* The work terminates with a brief account of the demise of the seven sages and of Nizami. *Nizámi* describes the auspicious aspect of the planets, as observed at Alexander's birth by the astrologers, as follows. Sol emerging from Aries (*Hamal*). Mercury, *Wtárid,* from Gemini (*Jonza*). Luna and Venus in Taurus (*Sawr*). Jupiter in Sagittarius (*Kaws*). Saturn in Libra (*Terazu*). Bahram or Mars, in the sixth mansion. *Asad* or Leo predominant.

In the second part of the *Secunder Nameh* we find the following traditions regarding the origin of the title of *Zu-al-karnein* ذوالقرنين or Lord of the two horns, bestowed by Oriental writers on the Macedonian monarch. First, because the horns had reference to the eastern and western worlds of which Alexander was supposed to be the conqueror. Secondly, because he is represented to have worn two peculiar ringlets on the back part of the head. Thirdly, because he smote the talisman of *Jemshid* with a sword having two blades like the famous weapon of Ali called *Zu-al Fakar* ذوالفقار. Fourthly, because he saw in a dream the *karan-i-falek* enclosed in the rays of the sun. Fifthly, because his age (at

* Aridœus, according to Justin and Diodorus Siculus, was an illegitimate son of Philip, who succeeded to the throne on the death of Alexander. After a reign of seven years he was cruelly put to death, together with his wife Eurydice, by Olympia mother of Alexander.

..e time of his coronation) amounted to two *karans* or decades. Sixthly, when Alexander was at the point of death his likeness was taken by some of his friends who added two horns, by which were typified his two guardian angels; these according to *Abu'l Masher* were subsequently mistaken for real horns. *Nizàmi* concludes his explanations with a story of Alexander having very long ears, which he concealed for a long time from the world, but the secret was discovered by an unlucky barber, who unable to retain it, breathed forth the fact of Alexander's deformity into a cavern. The story closely resembles that of Midas, and has evidently a common origin with that of the Phrygian king.

M. Antoine Galand, in his "Paroles remarquables des Orientaux," is of opinion, that eastern writers have conferred this title on him, from the circumstance of some Grecian coins of Lysimachus (particularly those of silver, on which Lysimachus is represented with horns) falling into their hands, which they have mistaken for those of Alexander. Their error, he goes on to say, arose from their not being able to decipher the Greek inscriptions, and from the coins being larger and more elegant than those of Alexander.

Of all the reasons just mentioned, I am inclined to think with D'Herbelot, that the first is nearest the truth; and that the horns have reference to the power and dominion of Alexander, though not in so extended a sense as the French savant and Persian historians would have us to believe. It seems to me highly probable that by the title of "The lord of the two horns," is signified his having been the conqueror of Media and Persia, the sovereigns of which mighty empires are typified in the vision of the prophet Daniel, as the ram with two horns.* M. Galand has not favoured us with any authority for his singular hypothesis.

Nizámi, as previously styled, flourished in the reign of *Thogrul Ben*

* "An he-goat came from the west on the face of the whole earth, and touched not the ground, and the goat had a notable horn between his eyes. And he came to the ram that had two horns which I had seen standing before the river, and ran unto him in the fury of his power. And I saw him come close unto the ram, and he was moved with choler against him and smote the ram and brake his two horns."

"The ram which thou sawest having two horns are the kings of Media and Persia. And the rough goat is the king of Grecia: and the great horn that is between his eyes is the first king." (Daniel chap. viii. verses 5, 6, 7, 20 and 21).

Arslan, the last sultan of the Seljukian dynasty, who reigned in Irak Persia; and died in the 64th year of his age, shortly after completing the *Khamseh*, A. H. 592. On his death bed he assembled his friends and exhorted them to walk in the paths of piety, and to hold fast the sacred truths of the koran. This done, he smiled and exclaimed—Oh dispenser of mercy! keep me steadfast in the hope of pardon, and preserve me from eternal punishment in admitting me to the joys of paradise. Whilst thus speaking the sleep of death came upon him, so calmly, so softly, that one would have supposed he was still awake.

Nizámi's Makhzen al Asrar is composed in the measure, or *Bahr*, *Mútawi Moukuf Sarí*.—The *Shirin-wa-khosro* in the measure, *Hazaj Makhzúf Musaddas*. The *Leila wa Majnun* in the measure, *Hazaj Akhzab Makbùz Makhzùf Musaddas*. The *Heft Paiker*, in the measure, *Khafif Muktu*, and the *Secunder Nàmeh* in the measure, *Mutakàrib Maksur Musamman*. I shall conclude the notice of the contents of the *Secunder Nameh* with a few cursory observations on the Oriental and Grecian accounts of the parentage, &c. of Alexander.

Alexander of Macedon سکندر مقدونیه is a monarch, even more celebrated in Oriental history, than in the classic annals of Greece and Rome. The accounts regarding his parentage and birth in both are various and conflicting. Some Persian writers contend that he was the son of *Darab*, sometimes confounded with Darius Nothus, by a daughter of *Filikùs* or Philip of Macedonia; and half-brother of *Dara*, Darius Codomanus. This princess is said to have been repudiated, when pregnant by Darius, and sent back to the court of her father, where the birth of her infant, Alexander, took place. Philip brought up and educated him as his own son. Others affirm that Philip, while engaged in the pleasures of the chace, found the corpse of a beautiful woman in the forest, with a newly-born infant by her side: Philip moved by compassion ordered the funeral rites to be performed over the remains of the unfortunate parent, and adopted the infant, the future conqueror of the world, as his own. According to *Abu-l-faraz*, *Said*, and *Yusuf Bin Gorion*, quoted by M. Claude-Visdelon, Alexander was the son of Olympia, the consort of Philip, by *Nectanele*, king of Egypt; who having been expelled from his throne by Artaxerxes Ochus, fled in the disguise of an astrologer, and took refuge in Macedonia.

Nizàmi alludes to the two first of these traditions, and states them to be unworthy of credit. He then proceeds to tell us that Alexander, *Secunder*, was the son of *Filikùs*, a celebrated monarch, whose sway

extended over the regions of * *Rùm* and † *Rùss*, and whose place of abode was in Macedon and *Yúnán*, Greece. The name of his mother does not appear; but *Nizàmi* describes her as a lady of Philip's court of surpassing beauty and majestic stature.

* Under the term *Rùm* روم, Greece, Rome, Romelia, Turkey and even the whole of Europe, have been comprehended by Oriental writers. It is, however, generally understood to be the name given by the Arabians to the country in Asia Minor, subdued by the Greek and Roman emperors, and subsequently by the Turks, which is conjectured to have derived its name from *Rùm*, one of the sons of Esau. Subjoined is the excellent description of D'Herbelot:

Art. *Roum.* " C'est le nom que les Arabes, et autres Orientaux, ont donnè aux pays et aux peuples que les Romains, et ensuite les Grecs et les Turcs ont soumis à leur obeissance.

" Il faut pourtant distinguer les deux significations que ce mot peut avoir. Car, outre cette generale, de la quelle on vient de parler, Ebu Al Ouardi dans sa Géographie intitulée, Kheridat Alágiaib, en donne une particulière. Car il dit que le pays de Roum commence à l'ocean Atlantique, ou occidental, et comprend, le pays de Gialaleca, la Galice, Andalous, L' Espagne, Afrangiah, la Françe, Roumiah l' Italie, Nemsiah, l' Allemagne, Leh, et Tcheh, la Pologne, et la Boheme, Inkitay, l' Angleterre, Magiar, la Hongrie, jusqû à Constantinople, et au Pont Euxin, par où il joint le pays des secalebah, ou, slaves, et esclavons qui confinent avec les Russes, ou Moscovites. Et enfin, le pays dit encore plus proprement, Roum, Romaniah, et Roumiliah, qui est la Thrace, et la Grece d' aujourd'hui.

" L' auteur du, Massahat Alardh, l' etendüe de la terre, écrit dans le second traité de sa géographie, que le pays de Roum, dans lequel il comprend seulement une partie de l' Asie Mineure, a à son occident, Khalig 'Al Constantinè, le canal de la mer Noire, à son midy, Belad Scham, et Belad Gezirah, qui sont la Syrie, la Mesopotamie, Arminiah, ou l' Armenie, au Levant et au Septentrion, Belad Kurg, qui est la Georgie, et Bahr Bontos, le Pont Euxin ; et qù au milieu de ce pays de Roum, est Gebal Carman, la Montagne de Caramanie, c. a. Le Mont Taurus, où habitent plusieurs familles Turques, et Turcomanes, dont la chaîne s' etend depuis Tharsous, qui est Tharse en Cilicie, jusqù à l' Hellespont. Et c'est dans ce pays de Roum trés proprement dit, que regnoient les Sultans de la dynastie des Selgiucides, appelez par les Arabes, Selagekah Roum, les Selgiucides de Roum, et d' où les Turcs Ottoman qui regnent aujourd'hui à Constantinople, ont pris leur origine, ce qui fait que les Persans et les Mogols aux Indes appellent les Turcs encore aujourd'hui, Roumi.

" Les auteurs Musulmans disent, que Roum, qui a donnè le nom a ce pays là, etoit un des enfans d' A'is, qui est Esaü, ou, Edom, ce qui fait dire à Hamdi Tchelebi dans son histoire de Joseph et de Zulikha, écrite en Turc, que Dieu donna plusieurs enfans à Esaü, et qu' il y en eut un d' entre eux, hommé, Roum, qui a donné son nom a tous les Roumilar, c. a. à tous les Grecs et Romains, et que les Princes Souverains de ces nations ont porté le titre de, Caiasserah, c. a. de Cesars."

† *Rùss* روس signifies Russia ; according to Richardson, so termed traditionally after *Rùss*, the eighth son of Japhet. It is here supposed to indicate the countries immediately to the N. W. of Persia.

Such are the statements of the Persian writers. We will now turn to those of the Greeks, by many of whom Alexander is said to have been the offspring of Olympia by an enormous dragon, while others give out that he was her son by Jupiter. M. Visdelon informs us, on what authority I know not, that he was the son of this lady by a Persian *Magi* named *Nestabánus.* "Ce qui peut être vrai en cela, est que suivant le rapport de quelque Historien Grec, *Nestabánus,* Persan de nation, et Mage de Religion, vit Olympius. Ce seigneur l'etoit venu trouver, la foudre á la main, et dans tout l'equipage de Jupiter ; soit que ce fut une veritable fraude, ou une pure collusion de la Dame. Se même auteur ajoûte qú Olympius avoua la chose á Philippe." It is well known that Alexander himself instigated by personal vanity, or rather perhaps for political purposes, encouraged the report, spread abroad by flatterers, of his divine origin. After the conquest of Darius, he caused himself to be worshipped as a god and led his army over the scorching sands of Lybia, to the oracular temple of Jupiter Ammon, there to be saluted by its sycophantic priests as the son of Jupiter.

These statements it will be allowed are equally contradictory with those of Persia. Mr. Ousely in a note to his Epitome of the Ancient History of Persia (p. 26) remarks, " It is not surprising that the Persian traditions on the life of Alexander should be vague and discordant, since the Greek historians acknowledge the obscurity of this subject." " Of Alexander" (says Arrian, Proem :) " various persons have recorded various things ; nor is there any one of whose history there have been more writers, or writers more disagreeing one with another."

The opinion of *Nizami,* from whatever source derived, and of those Grecian authors who suppose Alexander to be the son of Philip by Olympia, appears to have the best foundation. For it would be absurd to imagine that Philip would prefer a nameless foundling to his own offspring, or that the Macedonians would accept him rather than a prince of the blood royal as their sovereign.

The early Persian historians, who inform us that Alexander was the son of Darius, were, no doubt, influenced to do this both by a feeling of national vanity which would not allow of their admitting the subjection of the great Persian empire by a foreign prince, and through a desire of ranking among their own hereditary sovereigns, a monarch whose

deeds of arms and character for wisdom had been noised over the whole habitable world. The idle tale of his being the son of a dragon or of Jupiter is not worth while alluding to.

Mr. Richardson in his learned dissertation on the languages, literature and manners of Eastern nations (p. xiv) asserts that the Persian version of the history of Alexander corresponds with that of Greece and Rome, in nothing but the catastrophe, the death of Darius. Although it must be confessed that there does exist a great difference in the shading and filling up of the minor details of the two portraits, still there appears to me a striking resemblance in the outline and more prominent features. For instance, both Persian and Grecian writers agree in the mystery attending his birth—that auspicious omens attended it—that he was educated at the court of Philip with or by Aristotle—also in the age at which he was crowned, viz. two *karans* or decades—Alexander's imagining himself a prophet is probably a Mahomedan version of his aspiring to divine honours—in his expedition to Egypt—the Persian conquest—the circumstances attending the death of Darius—Alexander's espousal of the daughter of Darius, Roxana, or, according to the Persians, Roshana—his two expeditions to India—the visit paid him by the Amazonian queen Thalestris, as related by Q. Curtius (the *Noshábah* of the Persians), and the duration of his reign. The Persians fix the exact site of the place of his death at Zour, the Greeks at Babylon; both cities, however, are in Assyria.

According to D'Herbelot, *Abùlfaraz* fixes the duration of Alexander's reign at 12 years; the author of the *Tárikhi-Jehán-árâ* at 14 years. This first nearly agrees with the calculation of Petavius, according to whom, Alexander

Was born..................356 A. C.....Archon Elpines.
Philip died................336 A. C....Archon Pythodorus.
11th year of Alexander.......326 A. C....Archon Anticles.
Alexander died July 29....324 A. C....Archon Hegesias.

He was the last of the 2d or Kaianian dynasty of Persia.

III.—*Memoir Descriptive of the Vurragherry and Kunnundaven Mountains.—By the late Captain* B. S. WARD, *of the Surveyor General's Department.*

Situation and extent.—These lofty regions lie to the west of Dindigul, south of the famous temple of Pulney, and north of Perreakolum in the valley; their length from east to west is fifty-four miles, and their medium breadth fifteen miles, and their superficial area 798½ square miles (a very small portion of which, estimated at fifteen square miles, is under cultivation); the whole forming a confused mass of lofty ridges, intersected by deep valleys and ravines. The central parts, almost divested of wood, are plains, covered with a short stunted grass, the exterior ridges sloping down towards the low country, and the valleys they form are covered with high forest, more luxuriant and affording a greater variety of timber the nearer they approach the open country. These aerial regions are designated by the natives who reside on them, Keel and Mail-mullay (this may signify high and low), but more properly is a distinction of eastern and western mountains; those to the west rise to a very great elevation, some of the most conspicuous eminences being between six and seven thousand feet above the level of the surrounding plain, and fall excessively steep on the south, presenting at their summit a perfect wall of granite; to the north and east sloping down in extensive broken ridges, towards the open country; to the west falling gently and forming the valley of Unjeenad; and from it again to the south and west they rise abruptly into lofty mountains towards Travancore and Coimbatore. The cites of the villages on them are pretty nearly on the same elevation, and may be about 4000 feet above the open country. The inhabitants of these regions, are chiefly composed of the *Kunnùver* and *Karakat Vellaler* castes, and the population amounts to near 4000 individuals of both sexes.

Towns and Villages.—On that portion of the mountains to the east, denominated Keelmullay, and seen from the rock of Dindigul, the villages of note are Poolatoor, Tondygoody, Munnalur, Punnymullay, Patchelur, Perryur and Kowinjee; these have all a number of hamlets, lying promiscuously on the slopes of the valleys, amidst dry grain cultivation and plantain groves. On the sides of the streams, are narrow tracts formed in terraced beds, on which paddy is cultivated, irrigated by artificial canals; they also rear some wheat and garlic in the vicinity of the western villages of this tract. This division of the hills has a very fair proportion of forest, with groves scattered in the neigh-

bourhood of the villages, among them the jack, mango, orange, sago palm, and other trees, are spontaneous. The houses are in irregular clusters, built of mud and thatched. On the approaches to some of the larger villages are the remains of barriers, or gate-ways, as at Punnymullay, on a lofty ridge commanding an extensive view of the country towards Dindigul. Vilputty, Poomburra, Munnamanoor, with their subordinates, occupy the highest and central part of these mountains, and are all of them of some magnitude, having a large population. They are pleasantly situated on romantic projecting brows, commanding extensive views of the surrounding valleys and mountains. The houses are divided by regular paved lanes, and a principal street generally passes down the middle, with, at either end, a gateway, or barrier. The slopes in their vicinity are beautifully diversified with terraced fields on different levels, in which is cultivated garlic, mustard, tennay *(Pannicum Italicum)*; also wheat, and a species of grain similar to oats, by the natives called tovaray.* In lower valleys the rice fields gradually rise in a succession of terraces almost to the very summits of the ridges, irrigated from above by a succession of artificial canals, ingeniously conducted along the slopes, from dams thrown across often distant rivulets. Marshes are met with in low situations, where drainage is prevented by ridges crossing the valleys. In some of these, on the more elevated parts, the *wussumbu*, or sweet flag root, is obtained. This portion of the mountains, is divested of wood, a few groves in the ramifications, and some solitary trees on the slopes, being all that is to be seen. The jack, mango, and other useful trees, growing in profusion in the eastern portion, are unknown here, and fuel is now generally brought from some distant grove. The houses, built of stone and mud, and well thatched, are spacious, and, though low, are comfortable. They have each a fire-place, and sheds attached for their cattle. There are a few pagodas in sequestered situations at all these places; the only one of note, dedicated to Vailapúr or Subramunny, is at Poomburra. It is built of stone, has a respectable spire, and is highly venerated. An annual festival takes place here, when the car is decorated and drawn down the streets; the other temples are all inferior buildings and generally thatched.

The western portion of these hills, called *Mailmullay*, but better known by the appellation of *Kunnundaven*, is now a dependency of Travancore. Its superficial area is 231½ square miles, of which three square

* Barley.—R. W.

miles only are under cultivation. The north portion is studded with the villages of *Unjeenad*, a few being extensive, as *Khandel, Keelandur* and *Poottur*, and most of them beautifully situated on a table land. Nachyvile, though the capital, consists of only a few straggling houses, belonging to the *munnadies* or chiefs. It is situated in a low open valley, on the left bank of the Ambrawutty river, which meanders down the centre in its course north; and to the N. W. of it is Murraoor, a large village on a slope of the hills, with extensive cultivation of rice about it. The slopes of a table east of Nachyvile, hemmed in by black rocks to the north and west, on which is the village of Kharœ, are also extensively cultivated. Here they also grow some dry grain in small quantity. About the villages on the upper table, garlic and sugar-cane thrive. The cultivation of the latter is at present confined. Wuttawaddy, composed of two hamlets, occupied by about 15 Kunnuver families, may be mentioned for its situation in a narrow and deep valley, secluded from the sun's rays for four hours in the day, a circumstance which will give some idea of the elevation of the hills about it. At this place is some flat rice land, and the hamlets are situated on low but commanding eminences on either side. The pagoda of Teneashy on the left bank of the Ambrawutty near Nachyvile, is held in veneration, and is the only building of note in this tract. Here and there, on the black rocky ridges in the valley, are many of those antiquated small buildings, known by the designation of Pandy Coolys, some of them perfect; it is impossible to obtain any correct account of their origin.

Rivers, &c.—On these mountains are the sources of upwards of thirty large streams, which uniting, form eleven respectable rivers, the larger portion pouring down in a succession of falls into the plain country to the N. E. and S. E. Those of note in the eastern portion are the Jyempolliam river, having its sources in the chain of the Arunganul hills. It flows by Tondygoody, where it receives the name of Perryar, it then winds S. by E., and rushing down the mountains at the head of the Iyempolliam valley, is joined by the Shutar stream; passing by Punnacad, it now winds E. by S. in a deep forest to the hamlet of Shadamoopenputty. It passes through an open valley, the banks low, and bed sandy, where it is fringed with some cocoa-nut and mango groves near Iyempolliam. Here a dam crosses it; thence it runs S. S. E winding much, with steep banks, through dry cultivation to Tyencotta and Vadiputty. It crosses the high roads N. E. and E.

of Batlagoonta, and passing Dodiankota, joins the Vigay river, having run a course of twenty-two and a half miles from its source.

The Oomayar, rising in the Boothamulla hills, after fertilizing the table-land of Pauchelur, is joined four miles from its source, by the Kullar, a small stream from the Vaulrungatty hill. Thence, by the name of the Kodavenar, it flows S. E. three and a half miles ; E. by N. two miles, through a narrow wooded valley ; is joined by the Kolluparae stream running S. into it, from the table-land of Perryar ; then flows in a winding course easterly, obstructed by rocks, and precipitates itself down the mountains to the N. E. of Munnaloor ; thence, skirting the hills a short distance through a deep forest, it enters the plains, and joined by a large rivulet from the Audaloor hill four miles W. of Ahtoor, winds past the above place.

The Maunkurray, a small river, has its source in the northern summits of the Audaloor and Punnymullay mountains, winds down a wooded and confined very rocky valley, till it approaches the plains of Godulabavy. In its course through the flat country it has many inflections ; a rich soil is formed along its banks, and eight miles from its source crosses the road towards Pulney, east of Godulabavy, previous to which a portion of its water is turned south into the Thetthumpully tank ; thence it flows east.

The Nankasi or Nangangy river has its principal source in the Putchamullay hills, four miles S. E. of Veerupatchy, and descends to the west of it by the appellation of the Vaykalar, and being joined by the Perenkairymulla, issuing from the Perryar range of hills, slides down the N. W. face through a narrow wooded valley, fringed with teak and bamboos ; shifts for a short distance northerly, occasioned by the junction of a large rivulet from Patchelur, and winding through a flat expanse of forest to Purpul, a desolated hamlet, receiving in its course the Kunnanur and Vuddacad streams, precipitates itself down the hills to the lower table-land of Kotahvully, in a perpendicular cataract of 150 feet, into a basin worked in the rock by the force of its waters; escaping from which, it slides down a flat rocky bed, confined by precipices to one and a half furlong (where an artificial canal is conveyed from it), continues its course over a rocky bed, again precipitating itself to the base of the hills, half a mile from the above fall. These cataracts are called the *mail* and *keel tullacooth*. In the vicinage of the lower one, a romantic spot, is an ancient temple of Neelamulla Allaghercoil, held in veneration, and of high celebrity in times past. The Nankasi then flows north, passes west

of the ruins of Veeruputchy, and crosses the high road a mile and three quarters from the lower fall.

The Autucul river issues from the summit of the Aurunganul hill, descends abruptly down its slopes, and fertilizes for three miles the narrow vale of Perrumpullum, winds N. W. one mile and a half, and west one mile and a half through a narrow and deep valley, pours down in a series of cataracts, and, turning S. S. W. one mile and a half, receives the Kowinjee stream. The latter having run a course N. by E. six miles from its sources in the Permal range, is now called the Vurdaputnum river, winds N. W. three and a quarter miles to a dam constructed across it, the channel from it winding north runs towards Ayagoody. About two furlongs below the dam, a small branch goes off and is conveyed into a tank south of the above place; the river now splits in two, unites again about a mile below, and half a mile further on has a strong dam across it. The canal conveyed away on the right bank flows south of the hill of Pulney, and ultimately discharges itself into the large tank west of the temple. The river now assumes the name of the Wurretar, and, running a devious course of four and a half miles N. W. by W. through an open tract, discharges itself into the Palar, one and a half mile W. S. W. of the temple of Pulney, having run a serpentine course of seventeen miles from its furthest source.

The Palar rises in the open slopes in the Kullerungavvay hills, and only a short distance from the southern summit of these mountains. It flows in a small stream to the east, north of Shumbaganur, and N. E. five miles from the source rushes down by a series of cataracts between hills, to where a road crosses it to the east from Vilputty (here it is called the Munjarraar), and a short distance below receives the Vilputty, a powerful stream on the left, rushing down the ramifications of the Turdulla and Tinnewurray chain of hills, which swells it to a considerable stream; it then flows N. N. W. winding in a deep valley with shelving banks. On either side are tracts of paddy cultivation almost to Kapacad, an open spot on the right bank. In a winding it here receives a large stream from the Permal chain, and several lesser ones on the left. Rushing down the ramifications of the Tinnewurray range, it now makes many serpentine windings, labouring as it were to escape from the mountains, and ultimately precipitates itself into a deep chasm N. E. two and a quarter miles, from Koyconda; thence, confined between precipices, glides down in a thick forest over a rocky bed to the Iyempully *anni* or dam. Here a small branch of it is ingeniously conveyed into a canal from its right bank. Quitting the hills, it meanders through a forest N. W. to Mampully, a mausoleum on the

left, and Cunnavoymulla, a detached hill on the right. Here it gently assumes a northerly course through jungle, with several windings, flows half a mile west of Balsummoodrum, and passing on, receives the Wurretar on its right, and unites with the Perundelar W. N. W., two miles of the temple of Pulney. This confluence is considered sacred, and is called Shunmogen (literally six faces), by which appellation it is known in its course north. From its source it runs a course of twenty miles in a general N. N. W. direction, and, fed by mountain torrents on either bank, on quitting the mountains swells to a respectable river about one hundred yards wide with a deep bed. Across it is a dam one and a half mile S. W. of Balsummoodrum.

The Porundel river rises in the northern slopes of the southern summit of these mountains, in the open vale of Chummutancuvvay, winds gradually down it four miles, receives a powerful stream on the right, and below this confluence the road from Poomburra passes it to Vilputty; then confined winds three quarter of a mile to the N. W. and turns sharp to the N. E. and N., and, confined by lofty precipices, dashes down in a series of cataracts for four miles. On the right it receives the combined waters of the Pallunkye valley; these, pouring down in a confined cataract, give the river a N. W. course for a mile. On its left bank it receives the Poomburra stream, rushing down the slopes of Kowdamulla, flowing west of Poomburra, and receiving in its course the rivulets from the Kolatamulla hills. Thence it rapidly pursues its course along a succession of wooded valleys, and down several cataracts, until after a course of twenty-four miles it finally joins the Palar. From this stream several canals are conducted for the irrigation of several large tracts of land. It is known by seven names in different portions of its course; first, it is called the Koondur, which name it retains for several miles; afterwards the Ulular, and lastly, when it reaches the plains, the Porundalar.*

The Munnul or Putchar has its sources in the Oolurunkuvvay and Kellaven heights, forming the northern slopes of the hills, and pursues a north-easterly course down a series of steep descents, and through wooded valleys, in the progress of which it is joined by several smaller streams, and, finally, after a run of thirteen miles, falls

* As in the pages of this Journal it can scarcely be necessary to follow the minute details which the author has thought desirable for the illustration of his map, and as enough of these have been given to show how minutely he examined the courses of insignificant streams, I propose greatly abridging the remaining portion of this section of his Memoir.

into the Perandular. Two dams are thrown across this stream for purposes of irrigation, but one of them is unserviceable.

The Koodrayar has its sources in a marsh, on the west slope of the Kowdamulla hills, and pursuing a north-westerly direction, reaches the plains after a devious course of about sixteen miles, during which it is joined by several other considerable streams. As it enters the plains a dam is thrown across, and there is a deep canal on its left bank.

The Kodyurtanar, one of the feeders of the Tainar, rises on the southern heights of these mountains, and, taking a westerly direction, receives, about four miles from its source, a large stream from the Kowdamulla range on the right. Thence descending and repeatedly changing its direction, it is swelled by the addition of numerous large streams, pouring down from the hills on either side, until at Mungaputty, it is joined by the Cheggatar, after which it assumes the name of the Tainar, having now after a course of twenty-five miles, become a river of considerable note, unites with the Ambrawutty.

The Ambrawutty rises in the mountains of Tullar, east of Anymuddy, and rushing down the Unjeenad valley, is joined by the Arrewalla, a large stream, as well as by several others; flows by Nachyvile and the pagoda of Tenashy, on the left; somewhat further on it is joined by the Chinnar, forming a large stream, in which an island is formed, and then forms the fall of Jackumtavul, and, after being joined by one or two small streams, occupies a bed 200 yards in width. Here it is joined by the Poongatode on the left, and is arrested by a dam. Its length from its source till it enters the plains is about twenty-five miles. The Chinnar which falls into it has a course of about eleven miles running in a very rocky channel, and forming, from its source to its confluence with the Ambrawutty, the boundary line between Coimbatore and Travancore.

The Uttoiday is another tributary stream of the Ambrawutty, which it enters a little to the south of the confluence of the Chinnar, and forms a further portion of the boundary between Coimbatore and Travancore.

The Koondully rises in the southern mountains of Unjeenad, and, in a westerly course of seventeen miles, is joined by the Nuggraar on the right, and the Munnalar on the left, besides several other hill streams from the mountains on either side.

Roads, Passes and Defiles.—There is not one communication up to or on these mountains of an easy and gentle nature; every path leading to them has its dangers and difficulties, and as laden cattle are

constantly on the move up and down, accidents are not unfrequent, especially when the paths are steep, winding as they often do on the edge of precipices, where a single false step hurls the unfortunate animal to the bottom of some deep abyss. The path from Coimbatore across the mountains into Travancore, is, perhaps, an exception, and is much frequented by merchants travelling with laden cattle. This is the only road of note both practicable and comparatively easy. On crossing the Chinnar, it leads over a rather flat surface to the Pambar or Ambrawutty, one and a quarter mile. The cattle are here made to swim across, while the merchants pass over a temporary bridge of twenty feet space, between rocks; through this chasm the river rushes with great violence (only, however, during the periodical rains), thence it ascends a narrow ridge winding on the slope of hills, with the river in a deep hollow on the right, S. W. three and a half miles, it again ascends, and crosses a rivulet two miles, thence ascends a rugged acclivity, and along a flat surface to Shoracolum on the left, one mile. Passing a tract of paddy land, it ascends a paved defile to Keelundur, on the left three miles. From this village it ascends another defile, winds along low slopes (Khandel and Poottur on the right), and ascends, with many windings, the steep pass of Annuwurray, two miles (a road to Munnamanur here goes off to the left from the summit); it assumes a southerly course and crossing some ravines, winding over open table-land, descends to Coondullaytavalum six miles, thence in the same course, river on the left, crosses at three miles to Palacuddavu river, winding on the right, re-crosses it at Nuggraar one and a half mile, river on the left, keeps winding on easy slopes to Sundunakanultavalum, and crosses the river again below its junction with the Moonar six miles; the road assuming a southerly course, crosses the Moondrapully, on the right of which, it ascends to a pass W. N. W. of Chokanad hill, two miles, and enters the Naremungalum hills, after having perambulated a desolate tract of about thirty-one and a quarter miles from the Chinnar. This road is only frequented from January to July, and from the excessive length and difficulty, as also from rain at intervals, the merchants from Oodumullaycottah make but one trip; they start lightly laden with some cloths and culinary articles, and return with areka nut in the months of June and July; the largest portion of this time they keep moving by gentle stages.*

* In revising this portion of Captain Ward's Memoir for the press, I have been induced to take the liberty of suppressing the remainder of his rather prolix and unentertaining itinerary notices, under the impression that the country being unknown and unfrequented,

Woods and Jungle.—It has already been noticed that the summits of these regions are bare of wood, with the exception of a few stunted groves in sequestered situations. In the hollows and cavities a low brushwood of various plants entwined, mostly thorny and almost impenetrable, affords a close shelter to the wild hog. From the summit of the mountains, sloping down to the plains, the ridges, and the valleys formed by them, are crowned, the former with an open forest of various trees, among which some species of the Myrobolan are not unfrequently seen, also stunted teak. In the higher valleys, on the sides of the streams at their bottom, the forest is closely entwined with creepers, and in those at their bases, and bordering the plains, as also on some of the lower table-lands, teak, bamboos, and various timber trees thrive in quantities, especially on the northern and eastern sides; to the south there is some timber of an inferior size and quality.

Mines and Minerals.—None of any kind were observed: but the granite, which here forms immense precipices, also ridges of black

they can scarcely be rendered interesting, even to a reader about to visit the hills, and because they could not serve to direct him in his excursions without the aid of a guide. The above extract from this division of the manuscript is introduced, therefore, not in the hope that it would enable the traveller to find his way from Coimbatore to Travancore, but to show the general character of the roads by which the intercourse over these hills is carried on. From it we learn the very bad quality of the roads generally, since the best, said to be the only one both practicable and easy, is attended with so many obstacles and difficulties that it requires nearly a month to travel about thirty-two miles with lightly laden beasts of burthen. This example shows, in a striking point of view, the necessity that exists for some extra expenditure towards facilitating the intercourse, by improving the roads, between the plains and the hills, as well as between the numerous small villages scattered over them, since it is next to impossible, that any considerable advance can take place in the condition of the inhabitants, while they continue in their present almost impassable state.

The necessity for such expenditure will be rendered still more obvious, when I add that, such is the value of the products of the hills to the inhabitants of the plains, these roads, bad and almost impassable as they are, during a great part of the year, are traversed by numerous droves of laden cattle, carrying on an extensive traffic, not only between the inhabitants of the hills and plains, but between those of the plains on the opposite sides of the mountains. I would urge this measure the more strongly, because Mr. Blackburne, the very zealous Collector of Madura, has already ascertained that very much may be done to lessen the difficulties of these roads, at present in many places little better than sheep tracks, and greatly facilitate travelling, at a very moderate cost and which if judiciously expended, would, there is every reason to believe, be productive of the greatest benefit to the inhabitants. On this subject I beg leave to refer to my paper in the 15th Number, where the subject is more fully treated of.

R. W.

stones. Iron ore may be procured from the sandy beds of the streams; it may be obtained also from some kinds of black stones, but no advantage is taken of either.

Manufactures.—At Unjeenad on the west, some coarse black sugar, (jaggery), is manufactured in some quantities: ghee or clarified butter is made at all the hill villages, all, however, is consumed by the inhabitants, beside the above there is no other article manufactured on them.

Exports and Imports.—From the eastern portion of these mountains the exports to the plains may be classed under the following heads: turmerick, vendium or fennugreek, mustard, castor oil nuts, honey and wax, plantains and other fruits from the central parts; garlic is the chief export, with some mustard, wheat, wussumbu or flag root; from Unjeenad, paddy and small quantities of garlic are exported into Coimbatore. The imports to the central parts are rice (in case of a bad harvest), and to all parts of the mountains, apparel, household furniture, implements of husbandry, salt, and every other article requisite, are imported by merchants; the inhabitants also come down to the plains at stated periods, and purchase or barter for such necessaries as they may have occasion for.

Soil and Productions.—Scarce any difference is observed in the nature of the soil of these mountains, it being, in general, a stiff red clay, inclining to brown, and in the more moist situations it is a fine black mould; in the marshes, a deep black clay, the effluvia from which is considered unwholesome; it is excessively poor in lofty situations and more so in the central parts. The productions are rice, tennay, or the Indian panicle, garlic, mustard, wheat, tovarray, a species of grain similar to oats, to the east, turmerick, fennugreek, also several sorts of dry grains, as shamay, vurhaghu, raggy, &c. together with plantains, castor oil nuts, honey and wax: in Unjeenad some sugar-cane and beetle. The several sorts of dry grains produced in these regions, are only equal to the consumption, with the exception of such as are particularized under the head of exports.

Cattle and other animals.—These do not differ from those of the plains in their make or size, but appear on the whole to be in better condition, from the superiority of their pastures. The cows produce but small quantities of milk, and of an inferior quality, owing, it is

believed, to the want of salt, which the grass and herbs on the hills appear to be destitute of; as a remedy for which, the natives to the east preserve their urine in vessels and mix it in the cow's drink. The oxen, as also buffaloes, are employed in agriculture, a few of the former in carrying burdens, for which service however the tattoos are more in requisition. These small horses, being driven up in herds to the eastern hills, are very prolific and breed largely. The wild animals are the buffalo and elk who browse on the loftier hills, as also wild sheep of two descriptions, a few spotted deer in the lower regions, and the wild hog more numerous in the Kunnundaven hills. The red and flying squirrels are rare animals, seen only in the larger forests. That great animal the elephant, so famous for its depredations on fields and plantations, is never known to visit the more lofty regions, but periodically makes incursions on the lower table-lands of the eastern hills, as also into the valley of Unjeenad; they are numerous at the foot of the mountains.

Implements and mode of husbandry.—The implements in use are in every respect similar to those of the plains, in short are all obtained from the low country, and though the lands are prepared by ploughing, the garlic, mustard and wheat fields, undergo also the operation of digging and levelling, performed with the mamittys (spades); the seed being sown, the remainder of the labour of digging, weeding, and watering, devolves chiefly on the women, who are assisted by the men in taking in the harvest. Garlic produces two crops in the year, one in the month of August, the other in March. The rice fields are attended to by the polians and other classes till harvest time. The seed is sown in January and February in Unjeenad, the harvest follows in June, a second crop is obtained in January. On the hills of Poomburra and Munnamanur, they sow the paddy in October, the harvest, from the poor state of the soil, is protracted until June and July following; consequently there is but one crop obtained on these hills, yeilding an average of twelve fold. It is a singular circumstance, worthy of notice, that cranes and other birds which swarm in all the rice fields in the low country, never frequent these aerial regions, nor are any crows, kites or sparrows seen or known to visit them; the small dove is not uncommon, also blue pigeons, the latter, however, is a bird of passage, for the period they remain taking shelter in holes under precipices.

Climate.—The climate of these regions is very mild and congenial to the health of the inhabitants, the thermometer, during the months of June and July, was never observed to fall below 50° or above 75°; i is, however, said to be extremely cool after the rains in January and February; the ground is represented as covered in the morning with a hoarfrost and during this season the inhabitants complain of agues In April, some heavy showers of rain are experienced, ushered in with thunder and lightning, it is, however, warm from March till July, when they have partial showers, which increase daily, with strong bleak westerly winds, with short intervals of fair weather; till October, during this period they are enveloped in fogs, and the rivers swell in torrents after every shower. The N. E. monsoon, which now sets in with heavy showers of rain, ceases in the latter part of December, when the bitter cold weather sets in. Unjeenad, however, is on the whole a warmer climate, notwithstanding it experiences the same vicissitudes of the seasons and is more exposed to strong winds blowing down into it from the S. W.

Origin, Customs and Manners.—The primitive inhabitants residing in these mountains are the Kunnuver Vellalers who resorted to them, it is supposed, about four centuries ago; they may be classed with the Vellalers of the plain: yet they differ in their habits and manners, scarcely having any intercourse with each other, or forming any connection by marriage; this latter circumstance may however in some degree be attributed to the difference of climate, the extreme cold of which the inhabitants of the low lands are unable to endure. It is still more singular that even among themselves they have peculiar habits and customs, which distinguish those in the east from their western neighbours (the latter consider themselves as something superior), and have no communication with each other in marriage. The Kunnuvers of the east, by way of distinction, invariably use a teakwood stool when performing the marriage ceremony, those to the west are not so particular. The bride and bridegroom are seated on stools, the floor of the house being previously garnished with cowdung, and fantastically ornamented with streaks of flour of corn; when the operation of sprinkling saffron water is over, the husband performs the most important part of tying the tally, a small golden ornament, around the neck of the bride, the whole concludes with an entertainment to the relations and friends of both parties. The Puryum, or marriage gift to the relations, of the bride, is a pair of oxen, but to the west a single bullock, or sometimes a cloth is given as a present to the mother of the bride. Incon-

tinency is, however, very predominant, and a separation between man and wife not unfrequent, originating often in mere caprice. If a man feels an inclination to alienate himself from his wife, he has only to make his intention known to her parents, who receive her back with an offer of a pair of oxen; to the west, she is turned over simply with a vutty or metal dish, in use to eat victuals out of. In case a woman is displeased with her husband and absolutely wishes to part from him, she is at liberty to do so, only she must leave all her golden trinkets, if she has any, to the husband, those of silver she takes, it being considered as her own property: to the west, however, the wife is only permitted to take back such articles as she may have possessed before marriage, and if she has any children, they are left behind as the sole property of the husband. Should such separation take place when the woman is in a state of pregnancy (and in the interim she be married to another man), the child when born must revert to the legitimate father: the care and expense of nursing it, to the east, is recompensed by a donation of thirty fanams; towards the west it is delivered to the father on his demand, and no recompense made. The children of such a connection are allowed to grow up, and then return to their real father, who is bound to receive and protect them. A woman may marry as often as she chooses, but can have only one lawful husband at a time, though she may bestow her favours on another, provided he be of the same caste, any intercourse with a man of another tribe, would tend ultimately to expel her from the caste. A man may marry, if his circumstances will admit, as many wives as he pleases, for concubinage among them is not permitted, and to a man of some opulence two or three women are necessary in his domestic affairs; they are also very useful in the fields, the toilsome labour of weeding and watering devolving chiefly on them. Among the western Kunnuvers a rather singular practice is supposed to prevail in case of an estate devolving on a female from default of male issue; she is prohibited marriage, but undergoes the ceremony of being betrothed to some part of her dwelling; she is, however, allowed to have an intercourse with the opposite sex, and to the offspring of such a connection, if a male, the estate devolves. The women of the eastern parts are very uncouth and wear brass and metal necklaces, with a profusion of bangles on their arms and legs, and bore the membrane between their nostrils; the latter is also done by the women of the west, who are rather superior, and more modest in the wear of ornaments, a few stone or glass beads round the neck, called kulpashy,

and rings, are their only decorations; they wear a white cloth, not very clean, from above the shoulders, knotted in front, and made fast, round the waist with a bandage, those to the east wear theirs similar to the females of the low country. The men are very simple in their attire, having a couple of cloths, one worn round the head and the other about the waist, seldom or never wearing sandals, and by way of ornament, display a few golden trinkets pendant from their ears. Their dialect is the Tamul, which they speak fluently, but they are illiterate. The Kunnuvers burn their dead, but barren women, as also those who die of the small pox, are buried.

The Karakat Vellalers.—These people are the primitive inhabitants of Unjeenad, or five counties or portions into which this division appears to have been divided on their first settlement in these regions. They are considered a people of superior caste, their customs and manners affording indications of it, though they are not in any manner esteemed above those of the same caste in the low country. A bramin usually performs the duties at their temple, and the other ceremonies, marriages, &c. are performed by a pundarum, or priest of their own sect, speaking the low Tamul; most of them are illiterate, but a Tamul school has of late been established at Murraoor. They are a very abstemious race, and rice constitutes their principal food, as also tire, milk and butter, nor have they any aversion to fowl and animal food, and use ghee, (butter clarified), as a substitute for oil; with it they also anoint themselves previous to bathing; they are not addicted to spirituous or fermented liquors, but opium is in use among them in moderation, and they chew and smoke tobacco. The apparel worn by both sexes does not differ in the least from that of the inhabitants of the plains, consisting chiefly of coarse white cloths; the women, besides the small ornaments worn in the nose and ears, decorate their arms with silver bracelets, and those whose circumstances will not admit of its being of silver have them made of brass; a few of the men have one of the exterior membranes of the nose bored, and all invariably decorate their ears with rings; sandals for the feet are prohibited among them—they are known to associate with the Kunnuvers to the east, though their customs and manners greatly differ; both castes make no scruple of eating what is cooked by the other, but a Kunnuver when invited to an entertainment by a Karakat, is not admitted to that part of the house where the meals are dressed, nor is he allowed to touch any of the cooking implements. This class by the laws of their sect are contract-

ed in marriage when very young, but the union does not take place until the parties are at an advanced age, owing, it is said, to a deficiency in the number of females among them; some of the men are on the above account obliged to lead a life of celibacy. A plurality of wives, which is not uncommon, is only admitted in case the first proves barren, but a connection of such a nature cannot take place without the consent of the first wife, which must be obtained, and a widow is by no means restricted, she being at liberty to marry another man, if she feels so inclined, but they often prefer remaining in widowhood. Chastity does not appear to be a leading virtue with their women.

The marriage ceremony is performed at the house of the bride; a pandal being raised before the door, under it the parties about to be united undergo ablution, they then retire into the house, and are seated on the floor, previously garnished, with their faces towards the east, a lamp is kept burning on a stool, also a measure full of paddy and a symbol of Vignashuer made of cow dung, on the head of which are stuck two blades of the arruvumpilla grass, to it the bride and bridegroom prostrate themselves, on rising, the relatives present the tally, a small golden trinket, to the bridegroom, who ties it round the neck of the bride, a basin of milk being introduced in which is steeped some arisha leaves, *Ficus Religiosa*, with which the elder relatives sprinkle some of it on the heads of the bride and bridegroom; they then get up and prostrate themselves before their joint relatives, and the marriage concludes with an entertainment; on distributing beetle to the company, the bridegroom accompanied by his bride retires to his own house, where the day after he entertains the friends and relatives. The *puryum* or marriage gift is thirty fanams, and a cloth given by the bridegroom to the bride's relations; the money is converted into jewels to adorn her person. Estates invariably devolve to the eldest son; in case there be two or more, the property is equally distributed among them. They purchase their proedial slaves the Polians, the price of a male is thirty fanams, that of a female fifty. She is considered of more value for the children she may bear, who, when born, are the property of their master.

IV.—*Meteorological Experiments made on the Goomsoor Mountains.—By Lieut.* John Campbell, *Assistant Surveyor General.*

These observations are, from the want of leisure and from the inconveniences of a moving camp, necessarily very imperfect, but, in the absence of better, they are offered to the public, for the purpose of shewing the approximate height of the hilly tract west of Goomsoor, and in the hopes they may be of some use in shewing the relation between the wet bulb thermometer and the dew point; but no inferences on this subject have been attempted, in consequence of my not having seen Professor Apjohn's formula for this purpose; and on this account some preparatory observations, made with the instrument at different places in the Northern Circars, have been added to the register.

The hilly ranges of Goomsoor form part of an elevated tract of mountainous country, which extends from Gundipoor and Battily on the Calingapatam river, on the south, up to the Mahanuddy on the north. Their average distance from the sea is about thirty or forty miles, and they extend inland in width about sixty miles, where they meet the plains of the Sompore, Potanalkaulahunchy, and Jeypore countries. The extreme elevation is 2,500 feet above the sea; the lowest 2,000 feet.

In the south they are inhabited by a race of men called Sowrahs; in the north by the Khonds : these races in manners and habits are much the same, and both are distinguished by a peculiar pectoral mode of enunciating, although the language of both is quite different. The average height of the hills above the diluvial soil which fills up the valleys between them is about 1,500 feet, they are composed of granitic, trap, and porphyritic rocks, and are generally but scantily covered with jungle.

During the time the observations were made the climate was in general pretty healthy, and although sometimes the dew point underwent great alterations, yet it was commonly pretty regular; although it was found that, before the dew in the morning had been dissipated by the sun's rays, the hygrometer commonly gave the dew point two or three degrees too low.

The thermometer used was a small one of a six inch scale by Dollond, which agreed pretty well with the thermometer in the stem of the hygrometer by Newman. The wet thermometer was a small one taken out of the ball of a Daniel's hygrometer by Jones, and the bulb

covered with muslin and wetted with common water, as it was found to give the same indications as when wetted with distilled water.

To test the indications of the wet bulb thermometer the black ball of the hygrometer was covered with muslin, and both balls being wetted the enclosed thermometer gave the same indications as the small wet bulb thermometer, and therefore there appeared no reason to doubt its accuracy on account of its being small.

The barometer was a very rough instrument on the wet tube plan, and the scale very imperfectly divided. The observations have therefore been given reduced to the temperature of 32° Fahrenheit. The mean pressure at Chicacole at 10 A. M. was found to be 29.71; at Berhampore 29.75, and at Aska 29.68, which are sufficiently accurate to give confidence in the indications of the last instrument.

The hygrometer was one on Daniel's construction made by Newman, and the observations were generally repeated on any change of the dew point to ensure accuracy.

Barometrical Observations made on the Goomsoor Ghauts.

1836

Monecheeserroo	22d November	8 A. M.	27.19
	———	9 A. M.	27.27
Buchingiah	27th do.	6 A. M.	27.46
	———	9 A. M.	27.60
	28th do.	1 P. M.	27.40
	29th do.	7 A. M.	27.37
	———	10 A. M.	27.42
	30th do.	9 A. M.	27.60
	1st December	Noon	27.61
	———	2 P. M.	27.49
	2d do.	8 A. M.	27.58
	5th do.	10 A. M.	27.66
Woodigherry	1st January	11 A. M.	27.86
	———	3 P. M.	27.66
	2d do.	Noon	27.74
Sarrungurrah	15th do.	3 P. M.	27.39
	16th do.	7 A. M.	27.53
Sonepore on the Mahamuddy	11th February	3 P. M.	29.24

The rmometrical Observations in the Northern Circars.

Names of place of observation.	Date.		Time of day.	Dry ther.	Wet bulb do.	Dew point.	REMARKS.
	1836			°	°	°	
Munsoorcottah	July	29		84	79½	77	
		31	8 A. M.	83	80	79	Day cloudy, hot, close—no wind.
		—	4 P. M.	83	81	77	
	Aug.	2	7 A. M.	80	78	77	Morning clear, bright—heavy rain in night.
		7	3 P. M.	84	81	79	Strong wind all day—warm and damp.
		13		83	79	77	Damp day, cloudy, wind easterly.
Poondy.........		22		87	80	75	Cloudy, dry, warm.
Chicacole......	Oct.	2	2 P. M.	85	71	61	Weather dry, no rain for some time.
		3	7 A. M.	77	70	67	Little dew in night.
		—	10 A. M.	81	73	66	
		5	8 A. M.	78	70	66	
		6	11 A. M.	83	70	62	
		7	10 A. M.	83	73	65	
		8	11 A. M.	84	73	65	
		13	3 P. M.	87	75	68	
		18		79	69	63	Morning cold, wind N. W. from the hills.
		19	8 A. M.	75	65	61	Cold morn. a little dew
		22		85	71	63	Dry, windy, cold.
		26	1 P. M.	85	73	66	
Calingapatam...		27	9 A. M.	81	73	69	Dry, sky clear, no rain for some time.
		28	6 A. M.	69	64	64	
		—	7 A. M.	67	65	64	
		—	9 A. M.	79	71	67	
		—	Noon.	82	69	68	
		29	7 A. M.	73½	67	64	
		—	Noon.	83	72	66	
		—	5 P. M.	82	74	69	
In camp at Itchapore....		31		79	77	75	Rain, ground saturated, tent damp, wind.
Berhampore...	Nov.	3	7 A. M.	79	76	75	Heavy rain for three days, tent damp.
		—	2 P. M.	86	77	76	
		4	6 A. M.	77	76	73	
		—	9 A. M.	81	78	75	[thing wet.
Aska..........		11	6 A. M.	65½	61	60	Rainy night, every
		—	9 A. M.	69	67	62	
		—	2 P. M.	84	68	57	
		12	7 A. M.	68	65	64	
		—	9 A. M.	73	69	66	
		—	2 P. M.	83	73	66	
		13	7 A. M.	69	67	66	
		—	2 P. M.	84	71	64	

Thermometrical Observations on the Goomsoor Ghauts.

Names of stations.	Date.		Time of day.	Dry thermom.	Wet bulb do.	Dew point.	
	1836			°	°	°	
Monecheeser-roo..........	Nov.	21	6 P. M.	68	61	58	Evng. warm, no dew.
		22	6 A. M.	56	55	55	
		23	Noon	71	62	59	
		24	6 A. M.	55	50	45	Day dry, strong wind at N. W. no dew, very cold.
		—	6 P. M.	—	—	49	Wind fallen.
		25	8 A. M.	—	—	49	Minimum in open air 43"
Buchingiah....		26	1 A. M.	49	46	45	
		27	6 A. M.	43	40	37	Minimum 34"
		28	1 P. M.	77	55	—	No dew at 42" at the time of observation, minimum 33°
		29	7 A. M.	50	47	42	Minimum 32"
	Dec.	1	6 A. M.	43	42	39	Minimum 36°
		—	1 P. M.	77	60	—	
		—	2 P. M.	80	60	—	
		2	8 A. M.	57	54	50	Minimum 36"—morning clear, hay fog lying on ground, dew copious.
		—	3 P. M.	78	60	—	
		—	8 P. M.	62	54	50	
		3	8 A. M.	70	60	52	
		—	3 P. M.	72	60	—	
		4	3 P. M.	76	61	—	Minimum 36"
		5	——	—	—	—	Minimum 38"
Bavelamat		6	7 A. M.	56	50	50	
		—	10 A. M.	70	—	50	
		7	8 A. M.	55	53	50	
		9	8 A. M.	54	52	49	
		10	6 A. M.	49	47	45	
		—	11 A. M.	65	58	49	
		13	11 A. M.	69	55	43	Minimum 35°
		15	——	75	60	—	Minimum 43° maximum in tent 78½°
		16	11 A. M.	69	57	—	
		—	3 P. M.	76	62	—	
		17	9 A. M.	69	57	47	Minimum 46° maximum 78°
		19	1 P. M.	71	61	—	
Putlingiah		20	9 A. M.	68	60	50	
		21	——	—	—	—	Minimum 36°
		22	1 P. M.	75	63	—	

Thermometrical Observations on the Goomsoor Ghauts.

Names of stations.	Date.	Time of day.	Dry thermom.	Wet bulb do.	Dew point.	
	1837		°	°	°	
Woodigherry..	Jan. 1	9 A. M.	70	55	—	No dew at 46°. This place is in a large plain of 25 square miles.
	2	8 A. M.	65	52	—	No dew at 39° minimum in tent 42° maximum 81°
	3	8 A. M.	65	52	—	No dew at 39°
	—	8 P. M.	—	—	42	Minimum 46° maximum 81°
	4	7 A. M.	53	51	45	
Cormingiah. ..	6	7 A. M.	58	52	41	
	7	8 A. M.	71	64	56	Minimum 47° maximum 76° in tent.
	—	3 P. M.	79	62	52	
	8	7 A. M.	62	59	55	Minimum 45° maximum 76°
	9	8 A. M.	67	60	51	Minimum 41°
	10	7 A. M.	70	61	52	Minimum 42° maximum 75°
	—	10 A. M.	75	62	—	
	—	2 P. M.	74	59	46	
	11	10 A. M.	76	63	52	Minimum 42°
	12	——	—	—	—	Minimum 40°
Gottingiah	14	10 P. M.	54	49	—	
Savorugudda ..	15	Noon	75	58	—	This place is a large plain, 3 miles wide and 6 long.
	16	7 A. M.	61	58	53	Minimum 45°
	17	——	—	—	—	Minimum 40°
	18	9 A. M.	72	59	48	
	—	11 A. M.	75	58	—	
	19	6 A. M.	52	52	—	Minimum 40°
	—	7 A. M.	58	55	—	
	—	8 A. M.	64	59	—	
	—	11 A. M.	70	55	—	
	—	1 P. M.	76	57	—	
	20	7 A. M.	66	57	48	Minimum 41°
	—	2 P. M.	80	61	—	
Safpayenda.....	24	Noon	86	61	—	This place is a small valley surrounded by high hills.
	—	2 P. M.	86	62	—	
	—	4 P. M.	80	60	—	
	28	Noon	84	60	—	Sun powerful.
	—	1 P. M.	84	59	—	

V.—*Suggestions for an Apparatus for Registering the Tides.*— By Lieutenant J. Campbell.

TO THE EDITOR OF THE MADRAS JOURNAL,

Dear Sir,—Mr. Prinsep in his letter to you regarding the observation of the height and time of arrival of the tide wave, having offered no suggestion as to how the observation may be made, I therefore offer the following remarks. On the east coast of the Peninsula the surf every where prevents any possibility of ever guessing the time and heights of high water, and in the small rivers the bar is always so shallow as to prevent the influx of sufficient water, so that the head of the river is always much below the surface of the sea, and the current continues to run in long after the time of high water, until the sea has again fallen to the level of the river.

I believe an attempt was made sometime ago to register the tide by a float in the end of an iron pipe brought in from beyond the surf, but I believe it soon choaked with sand. I conceive that the required observations may be made beyond the surf, by having a large bamboo with the divisions bored through, set up beyond the surf and supported by four ropes under water, attached to small wooden anchors, the lower end may be allowed to enter six feet into the sand, and a round board fastened to the bamboo will prevent its sinking further. Above this board an aperture should be cut to allow the water to enter and the sand to fall out, which may be thrown in at top. The top of the bamboo being five feet higher than high water mark, the height of the water within the bamboo may be shewn by a rod attached to a cork float, and a flat wooden scale may be fixed on the rod with inches painted on it, which can be read off by a telescope from the shore. A piece of wire passing through a slit in the scale will ensure its being kept parallel to the shore.

A palmira tree might be used for the bamboo, the tree being split into two pieces and the pith removed, the pieces being again fastened together with rope.

I remain, dear sir, yours truly,

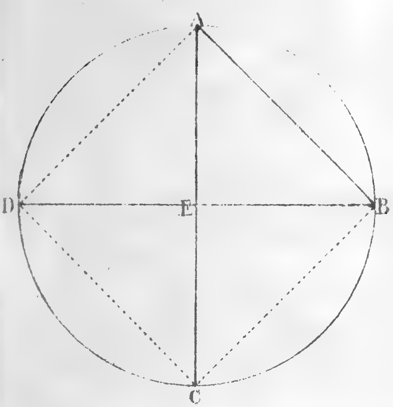
John Campbell,

Assistant Surveyor General.

23*d August* 1837.

VI.—*On the relative proportion between Circular bodies and their Squares.—By Captain* Cortlandt Taylor, *of the Madras Artillery.*

Being on a mission to the Malabar Coast connected with timber for the Ordnance Department at Madras, I found the native dealers in that article at Calicut disposed of timber cut to the *square,* varying about thirty per cent. from their measurement in the *round log.* I was induced in consequence to fall back upon school recollections, to ascertain how far this method was correct or borne out by theory, and which the subjoined mathematical process enabled me to do.* As the results, for comparative data, may be of practical utility, perhaps its dissemination will not be unattended with benefit.



Let ABCD be a circle, and the diameters AC, and BD, perpendicular to each other; then are the triangles AEB, BEC, CED, and DEA (formed by the radii of the circle and the points ABC and D being joined), right angle triangles and similar; having the common centre E a right angle in each; the legs AE, BE, CE, and DE (or circle's radii), equal; and the lines or hypothenuses AB, BC, CD, and AD, also equal, and together forming an inscribed square to the circle ABCD.

Then, as the circumferences of all circles are to their diameters, as 3.1416 is to unit; so 3.1416 is to 1, as the circumference of any given circle ABCD, is to its diameter, DB: but DB the diameter is the double of EB the radius, and EB is one leg or side of the right angle triangle AEB, of which AE is the other leg, and AB, is the third side, or hypothenuse.

Then, as in right angle triangles, the square of the hypothenuse is equal to the sum of the squares of the other two sides; in the right angle triangle AEB,—$BE^{2} + AE \stackrel{2}{=} AB^{2}$: but as BE, and AE are equal, their squares are equal also, and $2, EB \stackrel{2}{=} AB^{2}$ or $V2, EB \stackrel{2}{=} AB$, the *one-fourth* of the pevimeter of the required square.

Thus knowing the circumference of any circle, the pevimeter, or measurement of the inscribed square, can be easily ascertained; and

* The sale of the slabs pays the sawing expenses of squaring.

vice versa, knowing the square, the circle can be obtained and the difference or loss on the latter being squared is known.

PRACTICAL ILLUSTRATION.—To illustrate this demonstration by numbers. In the above figure, assume the measurement of the *inscribed square** ABCD at *one hundred* (say inches), of which the side AB is one-fourth or twenty-five. Then in the right angle triangle ABE (as before), the square of the hypothenuse (or side AB), or 25^2, is equal to $AE^2 + EB^2$; that is $625 = AE^2 + EB^2$; but as AE and EB are radii of the same circle and equal, their squares are equal also, and $625 = 2\,EB^2$; or $\frac{625}{2} = EB^2$; or $\sqrt{\frac{625}{2}} = EB$; or again $\sqrt{312.5} = EB$ (Extract root of 312—5).

312.5 (17,6776 the root,

	1
27	212 189
346	2350 2076
3527	27400 24689
35347	271100 247429
353546	2367100 2121276

That is 17.6776 is equal to EB; but EB, or radius of the circle, being half the diameter DB, then the diam. DB, is equal to 35,355.

Again (as before) unit is to 3.1416 as diam. DB, or 35,355, is to the circumference of the circle ABCD; or thus,
1 : 3.1416 : : 35.355 (by common rule of three), to 111.072. QED.

So, as an average for any general purposes of the department to which I belong, or for any merchant or artisan in his vocation, 11 *per cent* may be used as the difference between any cylinder and its square; or, by the common Rule of Three, as 111 is to 100, so is the measurement of any known circle to the square of that circle.†

A sphere or round body *cubed,* would of course suffer double the loss, or give a difference of 22 per cent.

COCHIN—MALABAR COAST, 16*th July* 1837.

* This is working the *reverse way,* but as it enabled me to come, by a single process, to the required information, it was adopted.

† The decimal .072, or $\frac{72}{1000}$ *per cent* may, for any practical purposes, be omitted as insignificant, but should a greater degree of accuracy be required, it may be obtained, I may say, *to fractional nicety,* by the addition of unit to the *sum of per centage* of every 1400,—which would so be, $14 \times 11 = 15 + {}_4 1 = 155$; or as 1400, is to 1555: and a half or double, &c., in proportion can also be used if necessary.

VII.—*Heights of the Neilgherry Hills.*—*By Captain* J. Underwood, *Madras Engineers.*

In the very interesting paper on the geological features of the Neilgherries by Dr. Benza (No. 13 of the Journal) the height of Sispara at the Koondahs above the sea has been recorded as about 5620 feet. Several observations by myself with a very good glass barometer fix the height alluded to at 6742 feet, and as I am not aware that a section over the hills from north to south has either been taken or published before, I have the pleasure to forward herewith the barometrical heights from the foot of the Koondah ghaut to Ootacamund, and thence down the New Seegoor ghaut to Seegoor at the foot of the latter.

Table of heights above the level of the sea:

Koondahs.	Sholay, bottom of the Koondah ghaut.	893.11	South westerly direction from Ootacamund.
	Bamboos cease	1757.6	
	Ladder hill (bottom of)	2972.	
	Vullycand camp (top of ridge)	4140.3	
	Vullyaur (river)	4050.6	
	Murraypett bungalow	6742.	
Avalanche range.	Avalanche ridge, top of,	7732.37	
	Avalanche bungalow (at bottom of ridge)	6720.2	
	Ootacamund lake level	7361	

New Seegoor ghaut. Commencing at the SevenCairn Hill.	Blink Bonnie, 4 miles from Ootac. top of New Seegoor ghaut	7204	North direction from Ootacamund.
	Sapperpoorum 1 mile down	6758.5	
	Stonehenge about 2 miles down	6182.17	
	Red Hill below Kulhutty, Burgher village about three miles down	5940.5	
	Waterfall point, proposed site for traveller's bungalow, about four miles down, and eight from Ootacamund	5538.8	
	Adam's Peak, north end of large basin, about $4\frac{1}{2}$ miles down	4982.8	
	Giant's glen, about 5 miles down	4296.5	
	Tent mydan, about $5\frac{1}{2}$ miles	4001	
	Bamboos begin hereabouts		
	Large nullah, bottom of ghaut	3408.9	
	Seegoor	3393.6	

It is much to be regretted that my friend Dr. Benza did not find his way down the new ghaut, for (beauty of scenery apart) the features of the country are most extraordinary, and well worthy the attention of one so capable of delighting both the scientific and general reader.

As Dr. Benza's narrative has frequently, to my knowledge, been adopted as a guide to travellers, and as on one occasion a party of five besides myself endeavoured in vain to find the "Devil's Gap" from the drawing thereof which accompanied his paper, owing to that faithful delineation being taken not from the road but from a point low down, I venture to send a rough sketch* of the Gap as seen from the route to Murraypett. The Gap alluded to is about two miles only from Murraypett Bungalow (not four as supposed by Dr. Benza), and is situated at a turn of the road immediately after descending rapidly from a high rocky bleak ridge, and at the entrance of a very remarkable narrow defile which leads to the Sispara range.

Camp Neilgherries, *July* 1, 1837.

VIII.—*Some Account of the New Colony of Western Australia, more especially of the Swan River District, the Natives, Settlers, Climate, Soil, Productions, &c.—By* William Milligan, *Esq.* m. d.—*Assistant Surgeon H. M.* 63*d Regiment—Staff Surgeon at Poonamallee.*

The new colony of Western Australia is situated on the western coast of New Holland, and extends from Cape Londonderry, in lat. 13° 44′ south, to west Cape Howe, in lat. 33° 8′ south, and Hertogs Island on the western coast in long. 112° 52 to 129 east longitude, reckoning from the meridian of Greenwich.

The Swan River district (the first settled, and as yet the most important) is situated in the great plain of Quartania, bounded on the north by the Swan river, lat. 32° 1¾′ long. 115° 40′; on the south by the Murray river, lat. 32° 33′ long. 115° 44′; to the east by the Darling range of mountains, and to the west by the Indian Ocean.

* We regret that we are unable to introduce a lithograph from this sketch, but we are necessarily obliged to be as economical as possible in our illustrations, and as a mere matter of topographical interest, we do not think one called for in this case. The sketch which accompanied Dr. Benza's memoir was intended to delineate the Gap as an interesting geological phenomenon. Captain Underwood's description will sufficiently indicate the true position, we think, for the guidance of travellers.—Editor.

Although I have called the Swan and Murray rivers the boundaries to the north and south as being fixed points, it would be more correct to say the country adjacent to these rivers, varying from one to four or five miles, the entire area being about fifty miles by thirty. Rottenest Island which is in front of the Swan river, was discovered by Vlaming in 1696.

The country is generally of the open forest description, in undulating plains, covered with a great profusion of trees, shrubs, and herbaceous plants, amongst the more important families of which are first the *Myrtaceæ* (Jussieu), comprising the *Eucalyptus*, and the guava, immediately related to it; these form nearly three-fourths of the forest. In this order we find the red gum tree *(Eucalyptus resinifera)*, the blue gum tree *(E. piperita)*, the brown gum tree or mahogany *(E. robusta)*, the white gum tree *(E. ——)*, the black butted gum tree *(E. ——)*, stringy bark tree *(E. ——)*; also the *Leptospermum*, *Callitris*, tea tree *(Melaleuca linarifolia)*, and others; these gum trees are found most useful for building purposes.

The second class in importance is the *Leguminosæ*, divisible into three principal families—the *Mimoseæ*, *Lomentaceæ* and *Papilionaceæ*. The *Mimoseæ* belong almost wholly to the genus *Acaciæ*, and are very generally diffused; amongst these are the black wattle tree *(Acacia melanoxylon)*, green wattle tree *(A. decurrens)*, and several other species. The *Papilionaceæ* include the *Gompholobium glaucescens*, and *Hovea rosmarinifolia*. The third class is the *Proteaceæ*, to which belong the *Banksia*, *Hakea*, and four species of *Grevillea*. 4th.—To the *Diosmeæ* (Brown) belong the *Boronia*, *Correa*, &c.—5th. *Dilleniaceæ* (Decandolle) different species of *Hibbertia*.—6th. The *Epacridiæ* (Brown) *Styphelea*, *Epacris*, three species.—7th. The *Compositæ* (Jussieu) *Aster*, *Bellis*, *Helichrysum albicans*.—8th. *Thymeleæ*, two species of *Pimelea* called *ligustrina* and *linoides*.—9th. *Solaneæ*, *Anthocercis albicans*.—10th. *Goodenoviæ*, several species.—11th. *Orchideæ*, several varieties; those which resemble the bee and butterfly are most admired—Umbelliferous plants and Filices. The more conspicuous plants and trees not belonging to any of these families, and which greatly contribute to give a character to the landscape, are a species of *Zanthorea*, or grass tree; a *Zamia*, or palm tree; three species of *Casuarina*, the she oak tree *(C. stricta)*, swamp oak tree *(C. paludosa)*, and forest oak tree *(C. torulosa)*; the latter make good shingles, and paling or fencing. The *Nutsya floribunda*, or cabbage tree, a singular plant, nearly confined to this part of the coast, and named after its discoverer; when in flower it much resembles the

orange tree in full bearing. The *Anthistiria australis,* or kangaroo grass; *Mesembryanthemum officinale,* or Hottentot fig; and the *Anigozanthos* (several species), a beautiful plant, called by some the 'kangaroo's claw,' from the resemblance of its flower to the fore-foot of that animal.

The trees and shrubs which are evergreens, are a great ornament to the country, and furnish fuel to the inhabitants, shelter to the cattle, and the leaves manure to the soil.

Of the indigenous edible plants which were found most useful to the early settler, are the sow thistle *(Sonchus)* Hottentot fig, the young stem and pith of the grass tree *(Zanthorea),* wild celery *(Apium prostratum),** wild carrots *(Daucus sylvester),* a species of *Orach (Atriplex Halimus);* and samphire *(Chrithmum):* these boiled with the salt provisions were a good substitute for spinach and other fresh vegetables. Of the edible fruits none were found deserving mention.

The soil is of three different kinds—1st, sandy—2d, alluvial—3d, red loam; the first is found near the coast, and, though unpromising in appearance, trees, shrubs, and grasses grow on it abundantly, and with the assistance of manure excellent esculent vegetables are obtained from it, as the valuable gardens in the farms of Perth and Freemantle sufficiently testify. The second or alluvial is in extensive flats, and produces admirable crops of wheat, barley, oats, &c., without any assistance from manure. The third, or red loam, which is met with on the high ground on the banks of the rivers, produces the same crops as the alluvial, but requires the assistance of manure.

There is a great deal of subterraneous moisture, which appears to be retained by a sub-soil of clay, which is to be met with at an average depth of five or six feet.

The mineral kingdom does not afford much variety; iron is abundant; mica and mica slate have been found at Kelmscott, and coal in the neighbourhood of King George's Sound. There is a blue clay of which bricks are made; calcarious rock is found along the coast; a ferruginous sandstone in several places; also soft grit,† or calcarious

* *Petroselinum prostratum,* De Cand.—Editor.

† M. Peron has attributed the great abundance of the modern breccia of New Holland, to the large proportion of calcarious matter, principally in the form of comminuted shells, which is diffused through the silicious sand of the shores in that country; and as the temperature, especially of the summer, is very high in that part of the coast where this rock has been principally found, the increased solution of carbonate of lime by the percolating water, may possibly render its formation more abundant there than in more temperate climates; but the true theory of these concretions, under any modification of temperature, is attended with considerable difficulty, and it is certain that the process is far from

sandstone, which hardens on exposure to the air, and answers well for building purposes; in some situations shells and the roots of trees are found imbedded in it ; I have not observed the trunks of trees in it as mentioned by the French navigators. The Darling range of mountains, which rise about two thousand feet above the level of the sea, and are capped with fine evergreen mahogany, are chiefly granite, with some quartz. The cleaning of the ground and the tillage are not very laborious, but, from the high price of labour, an expensive work ; oxen which cost from forty to fifty pounds per pair, and horses from fifty to one hundred and fifty each, are used in the ploughs; and farming is carried on in the English style, as far as practicable : the crops are sowed in May, June, July, and August, and sometimes so late as September, and reaped in December, January and February; the early crops succeed the best.

Along the banks of the rivers may be seen fields of wheat, barley, oats, peas, potatoes, turnips, pumpkins, Indian wheat, &c. intermixed with fine pasture land. The sandy soil is covered with coarse herbage, on which cattle thrive remarkably well; on the good soil, about sixteen kinds of grasses are met with, amongst which the kangaroo grass is conspicuous. The gardens furnish most kind of edible vegetables in great abundance; some of which may be obtained at all seasons. Amongst these are cabbages, endive, beet, parsley, cresses,

being confined to the warmer latitudes. Dr. Paris has given an account of a modern formation of sandstone on the northern coast of Cornwall, where a large surface is so covered with a calcarious sand that it becomes agglutinated into stone, which he considers as analogous to the rocks of Guadalope, and of which the specimens I have seen resemble those presented by Beaufort to the Geological Society from the shore at Rhodes. Dr. Paris ascribes the concretion not to the agency of the sea, nor to an excess of carbonic acid, but to the solution of carbonate of lime itself in water, and subsequent percolation through calcarious sand, the great hardness of the stone arising from the very sparing solubility of this carbonate, and consequently very gradual formation of the deposit. Dr. McCulloch describes calcarious concretions, found in banks of sand in Perthshire, which present a great variety of stalactitic forms, generally more or less complicated, and often exceedingly intricate and strange, and which appear to be analogous to those of King George's Sound and Severns Island, and he mentions as not unfrequently occurring in sand in different parts of England (the sand above the fossill bones of Norfolk is given as an example) long cylinders or tubes composed of sand agglutinated by carbonate of lime, or calcarious stalactite entangling sand, which, like the concretions of Madeira and those taken for corals at Bald Head, have been ranked improperly with organic remains. See King's Australia, appendix p. 595.—Swan river (Riviere des cygnes) upon this part of the coast, latitude 31—25 to 32, was examined by the French expedition. The rock in its neighbourhood consisted altogether of sandy and calcarious incrustations in horizontal beds, enclosing it is stated, shells and the roots and even trunks of trees.—Peron, vol. 1, p. 179—Freycinet, p. 5—170.

leeks, onions, radishes, carrots, nole-kole, parsnips, turnips, artichokes, vegetable marrow, and cauliflower; also cucumbers, pumpkins, water cresses, tomatos, cayenne pepper, and musk melon, rock melon, and water melon, in great plenty and perfection. The fruits now thriving are the grape, fig, peach, almond, apple, pear, strawberry, sloe, plum, several varieties; olive, the common and white mulberry, pine apple, plantain, sugar cane, Cape gooseberry; besides these, there are several others that will ripen here, which, in colder countries, never come to perfection; such as lemons, citrons, oranges; and much praise is due to that excellent botanist Mr. Drummond for being the first in succeeding to raise these fruits.

Of the animals I shall only mention such as are used for food, beginning with the fish, which are abundant, cheap and good. Among these are, king's fish; snapper (*sparus*); mullet (*mullus Malabaricus*); whiting (*eferianus*) skip-jack (*gasterosteus saltatrix*); flounder (*pleuronectes trichodactylus*); herring (*labrus*); sting ray (*ruja pastenaca*); cobler (*platystacus*); crawfish, crabs, shrimps, oysters, muscle, &c.

Horned cattle, sheep, goats and pigs furnish the inhabitants with meat of prime quality, milk, butter and cheese. The pig was a most useful animal; it increased rapidly, and soon supplied fresh meat for the settler, a matter of great importance in the early period of the colony, in checking the scurvy; which disease became very general from the long continued use of salt meat. The domestic fowls are turkeys, ducks, geese, pigeons, and the common fowl.

In the words kangaroo (*macropus major*) brush kangaroo (*macropus elegans*), bandicoot and opossum (*petaurus*), were tolerably plentiful; as also the bustard (*otis tarda*); emeu (*Rhea Novœ Hollandiœ*); black swan (*cygnus atratus*); cockatoo (*psittacus galeritus* and *psittacus funereus*); bronze pigeon (*colomba chalcoptera*); wild duck (*anas fera*); quails (*coturnix*) parrot (*platycercus scapulatus*) parroquets, several kinds (*psittacus formosus*); birds of paradise (*scythrops psittacus*); swamp pheasant (*cuculus phasianus*); wattle bird (*merops*); snipes and several other small birds.

Three rivers intersect this spacious valley, viz. the Swan, the Canning, and the Murray. They are supposed to have their source in small streams in the Darling range of mountains, which unite, gradually increase in size, and run from east to west, in a tortuous direction, with a gentle current, into the sea; they are affected twice a day by the tides, which render the water brackish during the summer months, but it is fresh and fit for use at other seasons. They are shallow for

the most part; in some places called the "flats" it is difficult at low water to get a boat over; the Swan is however navigable to vessels carrying three or four tons as far as Perth, that is, about twelve miles from the coast; the banks vary alternately on each side into hilly points and extensive flats, and are either sandy, alluvial or loamy, according to the tract of country they pass through. They are studded by trees, but neither the height of the banks, nor the number of trees, shade the water from free exposure to the sun and winds. Shoals of fish occasionally come up these rivers from the sea, and periodical floods occur after heavy rains, which overflow the banks and leave a deposit of alluvium on the low grounds; such a circumstance occurred in the winter of 1830. The fallen trees and stumps contribute much to increase these floods. Fresh water lagoons are numerous; there are also some containing salt water.

The water of the wells is abundant, and has the taste, odour, and transparence of the most perfect kind; it sparkles in the glass, and is found to answer to the utmost for all domestic purposes. It boils without leaving a sediment; is easily digested, excites the appetite, and may be drank freely without relaxing the stomach.

In the early period of the colony, there was some difficulty in finding good water along the coast, and in some other situations, but it was afterwards ascertained that it arose from the wells not having been made sufficiently deep. The water of some of the wells has still a darkish appearance, from not being properly cleared of roots of trees and other vegetable matter; in some places the water is impregnated with iron. In the government garden at Perth, there is a chalybeate spring which has been found useful in cases where a mild tonic is required. A small quantity of carbonic acid, carbonate of iron, and of muriate of soda, were found by analysis in this water; but I had not the means of ascertaining the exact proportions.

The strongest winds are from the north-west; the next in force from the south-west: the north wind is the hottest, and if long continued during the summer (which rarely happens) shrivels up vegetables and destroys their tender shoots. During the summer months there is a regular land and sea breeze, almost daily; the former of a morning from the east and north-east, the latter sets in about noon from the south and south-west; these winds render the intense heat of the sun less inconvenient and dangerous; the nights are cool, and the mornings and evenings agreeable. About 2 P. M. the thermometer begins to

descend, and the air gradually becomes cooler. During the winter the winds from the north-west and south-west are sometimes very boisterous; two or three gales occur in each winter, and are so violent at times as to drive ships which happen to be in Gage's roads from their anchors. However, no such accidents have occurred in the harbour of Cockburn Sound, where ships ride in great safety at all seasons. The sky in summer is clear and of a beautiful azure, without cloud, and with very little rain; moderate dews descend after sunset. As the autumn approaches, the weather becomes less serene; the sky is occasionally darkened with clouds, and lightning and thunder with heavy showers occur. These rains are in sudden heavy showers, with intervals of fair weather and sunshine. As they come after a long scorching summer they are very acceptable and beneficial, for they mitigate the excessive heat of the air, and, softening the sun-burnt earth, render it capable of being cultivated. In winter it rains for the most part of two or three days together, then an interval of eight or ten days of fine weather takes place. In damp weather a fog is seen occasionally of a morning or evening rising from the valleys and borders of the rivers, and ascending to the high grounds. Hail of a large size, about an inch in diameter, is sometimes mixed with the rain; snow has not been seen once, and ice is rare, being only seen out of doors a few times in the morning during the winter; it soon disappears after sun rise. A fire is agreeable morning and evening in the winter and in wet weather, but on the whole rather a luxury than an absolute want. The winter is a season of flowers; the beautiful *Metrosideras*, *Styphelea*, *Hibbertia*, a sweet scented little plant, called May, *Oxylobium*, and others, bloom at this season; and, as the spring advances, a profusion of others succeed, amongst which the *Anigozanthos*, *Kennedya*, *Hakea*, *Hovea*, *Helichrysum*, *Orchideæ*, *Drosera*, and *Thysanotus juncus*, or fringed violet, are conspicuous. The latter part of the spring is significantly termed by the natives, the "season of the yellow flowers," the meadows being enamelled with flowers of all colours, but the yellow predominating to a great degree.

Adjoining the Swan River district, and eastward of the Darling range of mountains, is an extensive tract of fine pasture land; the part at present settled is called Yorkshire; it is a cheerful country, well watered, covered with a short close herbage, free from underwood, and thinly timbered, and having a soil fit for raising all sorts of grain suitable to the climate. The merino and other breeds of sheep thrive well here; some of the wool has already been sent home, and brought a

high price in the London market. Salt mines have been met with in this district, near the site of a town called Beverly.

After giving these hints on the natural history of the colony, I should proceed next in order to describe the manners and customs of the inhabitants.

In the month of June 1829, His Excellency Sir James Stirling, Governor and Commander in Chief, with the Civil Officers in the ship *Parmelia*, attended by His Majesty's Ship *Sulphur*, having on board a detachment of the 63d regiment, under the command of Captain Irwin, arrived and took possession of the colony. Soon afterwards, the settlers commenced to arrive, and continued to pour in rapidly, until the latter end of 1830; at which period the population amounted to about two thousand. The ships which carried them out bore a strong resemblance to Noah's ark, being crowded to excess with all manner of beasts, birds and plants, as well as men, women and children, and provisions. If we suppose the population of one of the agricultural parishes in England, with a sprinkling of half pay officers of the navy and army, some gentlemen from the East and West Indies, and a few cockneys, put down on the shores of a wilderness, it will give some idea of the individuals who were destined to become the founders of this interesting new Colony.

The settlers may be divided into two classes, viz. gentlemen and labourers, many of them married and having young families, others single. Amongst the former, were a large proportion of highly respectable individuals, who were accustomed to refined society, with the comforts and luxuries of life; amongst the latter, were some industrious, able and valuable servants, but with these were mixed up a large number of idle and worthless men, amongst whom drunkenness was a constant vice. Perhaps it will be expected that I should say something here of the soldiers, but I may not say with Cleghorn, it is a task I would rather avoid,—pudet hæc opprobria nobis, &c. To say the least, the leaven of good amongst them was in much greater proportion than amongst the lower classes of settlers; and the complimentary address, voted to the detachment by the respectable inhabitants on its quitting the colony, is a strong proof of their good conduct.

The first object of the settler in landing was to get up a temporary shelter for himself and those in his establishment; these were for a time of a wretched description. Some used single tents, which afforded but little protection from the heat of the sun by day, and the cold and winds by night. Others were accommodated in huts built of

green wood, and pervious to every shower that fell; whilst many of the lower classes had no other awning day or night, than the canopy of heaven. After a little time, when the settlers got on their grants, buildings of a better description began to spring up. Some had wooden houses, which they brought out with them from London. Others had the same description of house made for them in the colony. Some erected houses of wattle and dab; that is, posts, about eight feet in height, erected at some distance from each other, and the intermediate spaces filled up with clay; to this was added a thatched roof and a chimney, which altogether formed a very comfortable dwelling. So soon as bricks could be made, or stone procured in sufficient quantity, good houses of such materials came into fashion.

During the first months of the colony, much anxiety was caused by the straying and loss of cattle in the bush, and by exposure to the weather of valuable plants and goods. Had any individual established a farm for the reception of cattle, and a ware-house to receive goods, it would have amply repaid him, and been the means of saving a vast deal of valuable stock and other property. No blame can attach to the government for want of arrangement on this head, as the settlers were apprized previous to leaving England, that they were to do every thing for themselves, and not to expect any assistance whatever from government. The zeal and activity, the kindness and attention, of Sir James Stirling, the Governor, in providing for all the wants and wishes of the people, so far as he had the means, were the theme of universal praise, and he was supported to the utmost by all his officers.

Travelling overland, or "travelling in the bush" as it is called, where neither roads nor houses were to be met with, though an interesting, was often a hazardous undertaking; but the danger did not arise from beasts of prey, none being met with in this country; but from the want of so simple a thing as a pocket compass. Being unprovided with this little instrument, was often the cause of many anxious hours as well as sleepless nights being passed in the bush. When the sun is clouded, so that one cannot guide his course by it, it is astonishing how readily you may go the wrong way; going a few yards out, will lead miles astray.

Things went on agreeably till about the beginning of the winter of 1830, when the supplies brought out from England, consisting chiefly of salt meat, biscuit and rum, became nearly exhausted; the crops which had been rather sanguinely calculated on, were scanty; provision reached a high price, owing to the irregularity of the supplies,

and monopoly of the merchants; a dread of scarcity of food prevailed; much fatigue, anxiety and exposure to the weather, had been undergone, and, to fill up the measure of evils, a flood took place in the rivers after heavy rains, which caused them to rise from fifteen to twenty feet above their usual level. All who had commenced their buildings on the low ground were obliged to desert them, and commence anew on higher ground. Scurvy now set in, also fever and dysentery; these diseases were mostly confined to the working classes, amongst whom there was much disease and some mortality; whilst among the higher classes, who were, comparatively speaking, well provided with food and lodging, and among whom temperance was more practised, there was but little disease and no mortality. A fear of famine existed at three different periods. Ships, however, always happily arrived in good time to prevent any mischief; the crops in the second harvest were more abundant than the first, and have continued to increase every season, in such ratio as to satisfy every competent judge that the crops of succeeding seasons will be sufficient for the whole population, and render them altogether independent of supplies from without. As the settlers got comfortably housed, and obtained vegetables from their gardens, and fresh meat from the increasing flocks, the scurvy gradually gave way, and at length ceased altogether. The fevers became fewer, and of milder character, as the country became cleared and drained.

The endemic diseases appear to be a subacute form of inflammation of the mucous membranes, viz. opthalmia or inflammation of the mucous membrane of the eye; dysentery, or inflammation of the mucous membrane of the intestines, and catarrh, or inflammation or congestion of the mucous membrane of the nares and air passages. Rheumatism was occasionally met with during damp weather in winter and autumn; also a low fever, the gastero-enterite. Providence is here, as in all other places, good and wise, and supplies remedies on the spot for the diseases which occur. Thus we find the *hirudo medicinalis* abundant in the lagoons, a well known remedy in these diseases; also aperients, as the kernel of the fruit of *Zamia*, and the produce of the *Eucalyptus mannifera;* astringents, as the red gum of the *Eucalyptus resenifera* which much resembles dragons blood, and the bark of the wattle, particularly the green, or *Acacia decurrens*, which contain much tannin; aromatics, as the *Eucalyptus piperita*, and *Leptospermum*, pennyroyal, *Pulegium;* and diaphoretics, as *Sassafras*, *Cryptocarya glaucescens*. No doubt many other medicinal plants may be obtained. I do not mean to assert that the diseases of this country are always confined

to the mucous membranes; on the contrary, I have known them occasionally affect the serous membranes, and also the solid viscera, but I conceive this to be the tissue generally attacked, and in which disease mostly commences; this, however, is only thrown out as a hint to future inquirers, which I do not much insist upon, my object being to record facts, rather than form hypotheses.

The exportable commodities which the soil and climate are capable of producing, are woods of various kinds, for cabinet use and for ship-building, and shingles; the barks of several of the indigenous trees, especially that of the *mimosa*, containing tannin in a highly concentrated state; gums of various species and qualities, particularly gum arabic; salt of an excellent quality is found in Rottenest Island; salt-fish has been already exported to the Isle of France and India; seals, of the kind from which the fur is obtained, are very plentiful on the coast; —the seal fishery will open two sources of wealth to the colonists; the first being a trade in skins, the second in seal oil. The sperm and black whale fishery will afford articles of profitable export, and tend, also, to make the settlement important for the refitting and victualling of vessels engaged in the trade. Wheat and flour find a ready sale in the Isle of France; it is more favourably situated for that market than either Van Dieman's Land or Sydney. Fine wool has been already exported and approved of in the London market—hides, tallow, and horns; tobacco, wine, flax and hemp; cotton, almonds, aniseed, bees wax, and honey; barrilla, cheese for India and China, carraways, cochineal, coriander; dried fruit, such as figs, currants, raisins, and prunes; hops, vegetable oils, olives, citrons, oranges, lemons, &c. &c. to which may be added the very important article, silk.

Of the Aborigines or natives, I shall only say so much as occasional intercourse with them has enabled me to become personally acquainted with.

On the first meeting of the settlers with the natives, the latter seemed alarmed, and withdrew; after a little time, however, they gained more confidence, and a friendly intercourse became established; this continued for some months, during which time the natives occasionally rendered a little assistance in labour, for which they were rewarded with food, particularly bread, of which they became very fond. The propensity to thieving, inherent among the Swan River, as well as all other, savages, soon began to display itself; whenever an opportunity offered food and implements belonging to the settler were carried off; the lower classes would make no allowance for their large

organ of acquisitiveness, and chastised them severely, whenever they discovered the theft. The natives, who appear to enjoy property in common, did not understand being punished for taking their neighbours' goods, and resented the insult. They attacked the houses of the settlers, generally of those living in isolated places, distant from the towns, plundered them, and sometimes murdered whomsoever they caught in the house. They also speared the cattle, and killed and carried away the sheep. In the rencontres which took place on these occasions, several black and eleven white men were killed, and a great many wounded. The government, anxious to put a stop to these atrocities, which endangered both life and property, offered a reward for the capture of Yagan, a supposed chief and ringleader. It was not long before this daring fellow, with two of his companions, were entrapped into a boat and made prisoners; they were sent to the island of Carmac, with an instructor, and two soldiers as a guard, for the purpose of being taught our language to interpret with their countrymen. After three weeks confinement, they rose one night, while the party in charge of them were asleep, seized a boat, and regained the main land and liberty. They were now forgiven, and with the rest of their tribe, became again on friendly terms with the settlers. Their genius for thieving could not, however, remain quiet; they were soon again discovered attempting to rob a store at Freemantle which contained provisions : the proprietor being alarmed got out of bed, fired on them, and shot one dead. Their rule in such cases being the *lex talionis*, they watched an opportunity for revenge. In a few days they observed a cart laden with provisions, and accompanied by two men, proceeding into the country; they proceeded to a lonely place in the road, where the cart was to pass, and waited for it. On its arrival there, the men were attacked and both murdered. A gentleman rode up while they were in the act, fired two shots at them without effect, and identified the three principals, named Midgegoroo, Yagan and Monday. The government immediately offered a reward for their capture, dead or alive; but the miscreants evaded search for some time; at length Midgegoroo was made prisoner by Captain Ellis, superintendent of native tribes, and a party of the 63d regiment, brought in and placed in the jail of Perth on the 16th of May 1833. He was tried and found guilty soon after, and was shot on the 24th of the same month. Not long after Yagan was met by a lad, the servant of a gentleman up the country, who shot him dead. Mercy was extended to Monday, who still lives and is the most daring of his tribe.

The severe and merited punishment inflicted on these unhappy in-

dividuals, has had a most salutary effect; the tribes have ever since conducted themselves peaceably, and are now on friendly terms with the inhabitants. It would seem to have been necessary to read them a severe lesson to teach them our superiority, and this could only be done by some summary punishment. The result proves that severity in the beginning is, in such cases, humanity in the end. It is to be hoped that these examples will be the means of preventing any further effusion of blood. The tribes are now under the care of superintendents, and daily receive rations from government. This arrangement, with moderate forbearance on the part of the settlers, will no doubt be the means of saving much property and preventing the waste of many useful lives.

The natives of western Australia are of middle stature, slender in limb, and many of them with a protuberant abdomen. The only article of dress is the waistband, or noodlebul, which is a long yarn of worsted, spun from the fur of the opossum, wound round the waist several hundred times; the cloak (booka), of kangaroo's skin, is worn chiefly by the women and old men, and occasionally, in the winter time, by the young men; they wear it as a mantle over the shoulders, fastened at the right shoulder with a rush (boerno). The large skins of the male kangaroo are appropriated to the women; the single men ornament their head with feathers, dogs' tails and other matters, and sometimes have the hair long and bound round the head, the women, who are mostly plainer than the men, use no ornaments and wear their hair quite short. Both sexes smear their faces and the upper part of the body with red pigment (wilgu), mixed with grease, which gives them a disagreeable odour. Their hair is frequently matted with the same pigment. When fresh painted all over, they are a brick dust colour, which gives them a most singular appearance. They have the same practice amongst them as at Sydney and King George's Sound, of cutting gashes on their body, and raising an elevated cicatrix: it is done chiefly on the shoulders and chest, and is both a distinguishing mark for different tribes, and an honorary distinction. The septum of the nose is also perforated, in which a feather or small bone is worn. Ornaments, however, are not considered as marking the man of authority, for they are worn by the young single men. Every individual of the tribe, when travelling or going to a distance from their encampment, carries a fire stick for the purpose of kindling light; and in winter they are scarcely ever without one under their cloaks for the sake of heat. It is generally a cane of *Banksia grandis,* which has the property of keeping ignited for a considerable time. Rotten bark or touchwood is

also used for the same purpose. They are very careful to preserve this, and will even kindle a fire by friction, or otherwise, to revive it. Their weapons consist of spears of two or three kinds, which are propelled with a throwing stick (meero). They have also a knife (tapo), stone hammer (ugardee), and curl koilee, or curved flat weapon, similar to the bomerang of the New South Wales natives.

The spears (gudye) are made of a long slender stick, about the thickness of a finger, of a heavy tough quality, supposed to be the black wattle; they are scraped down to a very fine point, and are hardened and straightened by the assistance of fire. Those intended for hunting and fishing, called moongaul, are barbed with a piece of wood fastened on very neatly and firmly with kangaroo sinew (peat), and the ligature covered with gum obtained from the grass tree. They are about eight feet in length; the war spears are longer and heavier, and are armed, for five or six inches from the point, with pieces of sharp stones fixed in gum, resembling the teeth of a saw, the stones increasing in size, the smallest being at the point; glass has been substituted for the stones where broken bottles have been found; each man carries from two to five spears.

The throwing stick (miero) is about two feet long and four inches wide, narrowing at each extremity; at the handle is fixed a piece of gum (wank), in which is inserted a sharp edged stone (tannela), which is used to scrape the point of the spear when blunted by use. At the outer end of the mecro is a small wooden peg (picota), which is inserted into a hole at the end of the spear, and by which it is propelled. The miero is also used at close quarters in their fights.

The hammer (uguadu) is made with a lump of gum having two stones imbedded in it, stuck on to the extremity of a short stick; it is used in climbing trees, in throwing at and killing animals, in breaking down grass trees, and for the common purposes of axe and hammer.

The knife (tapo), is a stick with sharp edged stones fixed in a bed of gum, at the end and for two or three inches down the side, forming a serrated instrument. The koilee, or boomering, is seldom used as a weapon, but for skinning the kangaroo, and also for amusement; some are curiously carved.

Their wigwams (boorno) are merely composed of a few small twigs stuck in the ground, and bent over in the form of a bower, about four feet high and five or six wide. They thatch them slightly with the leaves of the grass tree; in rainy weather they are roofed with pieces of bark, upon which stones are placed to secure them from being blown away; but they afford a miserable protection from the weather. They

are generally erected in a sheltered spot, near water, with the back towards the prevailing wind, and a fire is kept burning constantly in the front; one hut contains several individuals in a crowded state—the dogs, also, are admitted to a share of their bed. An encampment rarely consists of more than seven or eight huts; for, except during the hunting and fishing season, at which time large parties assemble together, their numbers are generally small, and two or three huts suffice. The number of individuals, however, seldom exceed fifty. The huts are so arranged as not to overlook each other; the single men have one to themselves, the children sleep with the women in a large hut near the husbands: these encampments generally consist of near relatives, and comprise families rather than tribes.

Those families who have locations on the sea coast, quit it during the winter for the interior, and the natives of the interior in like manner pay visits to the coasts during the fishing seasons. As the country does not abound in food, they are seldom stationary, removing, according to the time of year, to those parts which produce the articles of provision which may be in season. During the winter and early spring they are very much scattered, but as summer advances they assemble in greater numbers. It is at this season that they procure the greatest abundance of game; it is done by setting fire to the dry underwood and grass which rapidly burns. With a kind of torch, made of the dry leaves of the grass tree, they set fire to the sides of the covert, by which the game is inclosed and cannot escape. The hunters, concealed by the smoke, stand in the paths most frequented by the animals, and spear them with facility as they pass by. On these occasions vast numbers of animals are destroyed; the violence of the fire is frequently very great, and extends over many miles of the country, but this is generally guarded against by their burning it in consecutive portions. The women also kindle fires, but only for the purpose of taking bandicoots; they sometimes however, accompany the men at the larger firings for kangaroos or waleby. As soon as the fire has passed over the ground, they walk over the ashes in search of lizards and snakes, which are thus destroyed in great numbers, and those which have escaped their holes are easily discovered. In the chase the hunters are assisted by dogs, which they catch young and domesticate; but they take little pains to train them to any particular mode of hunting. In size and appearance they resemble our fox hounds; they appear to have a very fine scent, and draw upon their game like a pointer, after which they spring

upon or chase it. When the owner does not wish the dog to follow, he ties the foreleg to the neck with a band of rushes, and leaves him in a shady place; he frequently carries the dog on his shoulders. They are excellent watch dogs, and will attack strangers; in the wild state they are sometimes killed by the natives, who eat their flesh, but of the skin no use is made. The mode in which they hunt the kangaroo is in small parties, or singly; they select a time when the rain is pouring heavily, or the wind blowing hard, to prevent the noise of their approach being heard, for the kangaroo is very quick in hearing, and always on the alert. The hunter creeps upon them with the greatest caution, and generally succeeds in approaching them unobserved. If possible they keep the wind in their face, and when one is observed, they take off their cloak, and when the animal stoops or turns his back upon them they hastily advance, keeping a bush between them for concealment. As they approach their prey, they move very lightly in a stooping posture, and only at the time when the noise of the wind prevents their footsteps being heard. Should the kangaroo turn round and observe them, they instantly stop and remain perfectly motionless until he resumes his feeding. In this way they approach within a few yards of their prey, and then pierce him with their spears; the instant he falls they run up and dispatch him with their hammers by blows on the head. The first operation is to extract the two front teeth of the lower jaw, which they use to sharpen spear points; then they seize the tail, and, taking the end in the mouth, bite off the tip, and by pulling, extract the sinews which are inserted in it; these are bound round a stick, and dried for use, either for the purpose of stitching the mantles or tying the barbs on the spears. Another mode of hunting the kangaroo, when huntsmen are numerous, is by surrounding and gradually approaching the game, until they get sufficiently near to spear them.

The emu is speared chiefly in the winter, at which time they lay their eggs; when a nest is found, the hunters conceal themselves behind a bush near it, and endeavour to secure the male bird first; the female they are pretty certain of, unless she has been disturbed, when she will forsake the nest. Emus however are not very often procured by the natives, but with them kangaroos are highly esteemed as articles of food; lizards also afford a favourite repast, and, at some seasons, form a considerable portion of their food; there are three species that are eaten. The snakes which are eaten by the natives are of several kinds; when the natives kill one they are careful to beat its head to pieces before they take it up; they then examine if it has recently

eaten, and if it has indigested food in its stomach, they reject it; for, if eaten, they say it would cause violent vomiting. At the spring time of the year they live principally upon the eggs and young of birds, chiefly of the parrot tribe, but also of hawks, ducks, swans, pigeons, cockatoos, land turtle, &c. They are extremely expert at climbing trees, which they do by notching the bark with their hammers, in the same manner as is practised in Port Jackson. Thus they procure opossums, which they trace to their holes by the marks of their claws upon the bark; there are two species, one the common ring-tail (uwarra), the other, comal: they are not often found in the same districts, the cernul living chiefly in lofty and thick woods, whilst the ring-tail is frequently found in swamps, and the low brush which surrounds them. The comal is of larger size and much lighter colour, with a brownish bushy tail; it is also fatter, the fur is longer, of a whitish colour, and is spun by the natives into a kind of worsted, called by them peteroe, of which the noodle buls are made; the fur of the ring-tailed opposum is not used. That of both species is easily detached from the skin. The comal is frequently hunted with dogs by moonlight, when it is either speared in its flight, or driven to its haunt in some hollow tree; the natives then make a hole, and extract it, but should it be too difficult or troublesome, they kindle a torch of grass-tree leaves and push it into the hole, when, in attempting to escape, the animal is easily taken.

During the summer and autumn months the natives derive a large proportion of their food from fish. They have no canoes, neither do they swim well. They have neither nets, nor hook and line, and the only weapon they use is the spear, with which they are very dexterous. In the mouths of streams they take large quantities by weirs made of bushes; but the most common method is pursuing the fish into shoal water and spearing them, or as they lie basking on the surface. Fish being very plentiful, they often kill more than is sufficient for present use; in this case they roast them, and, separating the flesh in large flakes from the bones, pack it carefully up in soft bark, in which way it will keep good for several days. Immediately on killing a large fish, they make a small opening just below the gills, through which they extract the entrails; if there be any fat, it is carefully separated; the bowels, liver, &c. they cook and eat. Although sharks are numerous, the natives are not at all alarmed at them; sometimes they will spear them, but never eat any part of the body. Sting-rays and maiden-rays are also common, but not eaten; though sometimes killed for amusement. Crawfish ("challons") and prawns, are to be

obtained in the Swan river in some quantities, the natives roast them in the ashes and eat them. Frogs (" cooyah"), of two or three species, are eaten, chiefly at the season of their spawning. Grubs of different kinds are eaten raw or slightly roasted; the eggs of the ant also form an article of food. Of the vegetables on which they feed a few kinds only are known; the following, however, are more used than any other, and may be said to form the staple article of diet: boom, wyeing, matta and sudening bean boovulerang, a species of yam which they are very fond of; the boom are scarlet roots, not unlike in shape and size to tulip roots. They roast them in the ashes, and then pound them between two flat stones, rubbing the latter with a ball of earth to prevent the root adhering to it; when thus prepared they are mucilaginous and of a glossy black colour; they may be considered the bread of the natives who live near the coast. The wyeing is of the tribe *orchideæ*; it is very pleasant eating when roasted. The mutta is the small bulbous root of a rush; it is very fibrous, and only edible at one season; the roots of fern, sedge, and other plants, are also used as articles of food; also mushrooms of two species, and another kind of fungus. When the different species of banksia first come into bloom, they collect from the flowers a considerable quantity of honey, of which the natives are particularly fond, and gather large quantities of the flowers " monca" to suck; it is not, however, always to be procured: the best time is in the morning, when much dew is deposited on the ground; also in cloudy but not wet weather.

The natives at Swan river live upon the productions of nature, unassisted by art, varying at different seasons and in different districts; poor in quality, often scanty, and therefore compelling the natives to a vagrant life. The population consequently is far from numerous—they have no general chief, and associate and disperse as season or inclination leads them. Their wars appear to be more between individuals or families, than between tribes or districts. There are numerous subdivisions into tribes and classes, who appear to have little bond of union between them; the men go two or three together, unless they have some particular object in view; they are extremely jealous of their food, concealing and eating it silently and secretly; yet if others are present they usually give a small portion. When they are successful in hunting or fishing, they instantly make a fire, and eat a portion of their fish or game; the married men generally reserve a share for their wives. Of the children they appear to be very fond, and rarely chastise them; but their treatment of the women is not always so gentle, and

many of them have spear wounds in the legs or thighs, inflic ed by their husbands. The women are very useful to them, not only in procuring food, but also in preparing their cloaks, building their huts, and other menial offices. They possess few utensils, and these are of the rudest construction; a piece of soft bark, tied at each end, serves for a drinking cup; the claw of a kangaroo they use for a needle, and through a hallow rush, or the wing bone of a bird (neveel), they suck the water, when it cannot be conveniently reached with their mouth. Polygamy is a general practice amongst them; one man sometimes having many wives. The girls appear to be at the disposal of the father, and are generally bespoke in their infancy; even before they are born we are told they were betrothed, if they prove to be females. The persons to whom the girls are betrothed are not unfrequently men of middle or advanced age, and possessing already several wives; they are, however, often more equally matched. Like those of other savage tribes, the women suffer little from child-bearing, and even the next day walk out to seek their food as usual. For the first few weeks the child is carried on the left arm in a fold of the cloak, but subsequently is suspended on the shoulders; until they can run alone, they are not clothed. In cases of twins one of the children is killed (of different sexes, the female being preserved), the reasons assigned for which measure are that a woman has not sufficient milk for two children, and cannot carry them and seek her food.

When individuals quarrel, it is taken up by their respective families; when a man is killed, his tribe instantly sets about revenging his death, but they are not particular whether they kill the principal offender or any other of his tribe. This feeling of retaliation is, however, extended much farther; for if a man be killed by accident, the friends of the deceased will impute his death to some bulgal (or doctor) of an adverse tribe, and kill an individual belonging to it in retaliation. Also when a man is seriously ill, and fancies he shall not recover, he will attempt to kill some body, in hopes thereby of recovering. In their personal conflicts, they use their hammers, throwing-sticks, and towks, to strike with, and the blows therewith inflicted would doubtless frequently be fatal, but they seem incapable of giving a heavy blow, and strike more like women. For depredations in each others grounds, or any slight cause, they are contented with spearing through the legs or thighs, and do not attempt to kill each other, and the moment one of the party is wounded the engagement ceases.

They have their doctors (bulgal) who attempt their cures by charms. On one occasion I witnessed the remedies applied for a sick child: the doctor inhaled the perfume of different plants, and then breathed into the mouth of the child; this was repeated several times; he also sat on the haunches like a monkey, and grinned most hideously at the child, jumping about occasionally, and repeating the grimace; he likewise rubbed his hand over the chest and stomach repeatedly, and snapped his fingers in the air. A native was one day writhing with pain on the ground in the barrack square; the bulgal approached him, and, with a piece of glass, cut from the angle to the symphisis of the chin on the right side. On looking into his mouth afterwards, to ascertain his disease, I saw a hollow tooth in the opposite side.

The diseases which they are chiefly subject to, are dysentry, opthalmia, catarrh and rheumatism, and these occur but seldom. Their poor diet, want of clothing, and the miserable huts they dwell in, will readily account for their suffering from vicissitudes of the weather which give rise to these diseases. It is only surprising that they are so remarkably healthy.*

Previous to entering upon a description of the weather, I shall first offer a few remarks on the topography of the town of Perth, where these observations were made.

Perth, the seat of government, is situated on the northern bank of the Swan river, eleven miles from Freemantle, on a gentle elevation, thirty feet above the level of the river, and about forty above the sea. It is bounded to the south by the Swan river, which is three quarters of a mile broad opposite the town; to the north by a string of fresh water lagoons, which are continuous up to the mountains; to the east by an extensive plain terminating at the Darling range of mountains twenty miles distant; and to the west by mount Eliya, which, running north and south, affords considerable protection from the strong gales coming from the north west and south west. The Swan and Canning rivers unite immediately below the town in a large estuary, called Melville water: this fine expanse of the meeting of the waters much resembles two large lakes running into each other. The sea breeze in reaching the town is further cooled down during the hot weather by crossing these waters. The soil is light, dry and sandy, with the exception of the banks of the river, which is alluvial. The substratum

* For a full account of the natives of King George's Sound, see in Geographical Journal and King's Australia.

is sandstone; the water in the springs abundant and wholesome, in some places impregnated with iron. The principal streets are ninety-nine feet wide; one street runs about a mile in length, and is intersected at right angles by several others : the houses are built of brick and mortar and some of wood; they are placed on separate allotments, each ninety-nine feet wide and three hundred and ninety-six feet long, which are fenced in; a portion of the ground is generally converted into a garden; the gardens in front of the houses, and the large trees interspersed between, with the boats passing up and down the river, give the town a cheerful and picturesque appearance. The streets are not yet paved, but there is an agreeable walk along the bank of the river, and the rides about the town, along the bush roads to Guilford and Freemantle, are pleasant. Population three hundred.

It may be said of Perth as Hippocrates formerly said of towns similarly situated, well exposed to the sun and winds and abundantly supplied with good water (De agre locis et aquis—Opera omnia, page 195), hæ minus a mutationibus temporum officiuntur: and diseases are less severe and less common here than in most other places.

I may also here mention Freemantle, the town second in importance, which is situated on the coast close to Gage's roads, on the southern bank of the Swan river, where it disembogues into the sea. The streets run at right angles, are sixty-six feet wide. The houses are built of a soft grit or calcarious sandstone, which hardens on exposure to the air, looks well, and is found in abundance in the neighbourhood. It is chiefly inhabited by merchants population about three hundred.

There are several other towns in progress, the most advanced of which is Guilford, situated about eight miles higher up the river than Perth, on a pleasant terrace, in an agreeable neighbourhood, where the soil is uniformly good.

These things being premised, I proceed to describe the most remarkable changes of the weather during the four years included in this notice.

Whenever the thermometer is mentioned, it is to be understood of a large mercurial one, graduated according to Fahrenheit's scale, kept in a proper place within doors (either in a wooden building or a thatched hut, with a southern aspect) except when I describe the sun rays, the intensity of which was measured by a smaller instrument of the same kind, hung out of doors, at some distance from the walls of the houses; no difference was observed between them, except that the mercury in the smallest was soonest affected by heat or cold, and consequent-

ly a little quicker in its motions, which occasioned it being found a degree or a degree and a half higher in summer and as much lower in winter, than the quicksilver in the larger thermometer. The difference between the heat of the air warmed by the direct rays of the sun, and that within doors was on an average 18 degrees; whenever it was remarkably greater, notice will be taken of it. The observations were made at 7 A. M., 2 P. M. and 7 P. M. The highest degree of heat generally occurred at 2 P. M., soon after which period, the sea breeze had fully set in at Perth, and the thermometer commenced to descend. The height of the thermometer at a medium is calculated from its average height at these different hours. The barometer was included in the same case with the thermometer, the whole made by Cary of London. It was occasionally heard that the barometer rose a little before wet weather, but this was an exception to the general rule. I regret the want of an hygrometer prevented upon me from ascertaining the exact dryness or humidity of the atmosphere; but this deficiency is in some measure supplied by the number of rainy days being noted, as well as by extracts from the register of the pluviameter kept by my friend A. Colin, Esq. Colonial Surgeon at Garden Island and Perth—for which see Table at the end.

1830, *March.*—Was fine for the most part, a little rain fell on the 11th, also on the 24th, at new moon; heavy rains on the 18th, lightning and thunder on 31st; prevalent winds E.—N. and N. E.

	Max.	Med.	Min.
Thermometer......	88	73½	58
Barometer.........	30.30	30.05	29.80

April.—Early part cloudy and showery, middle fine, latter end cloudy; showers fell on 1st, 4th, 5th, 6th, 7th, 16th, 24th, 27th and 30th; lightning and thunder on 16th, 22d, 24th and 27th; winds N. W.—S. W. and N. E.

	Max.	Med.	Min.
Thermometer......	87	68½	54
Barometer	30.30	29.95	29.60

May.—Fine till 13th, when some rain fell in the evening, preceded by thunder and lightning; on the 14th very loud thunder and lightning with much rain; on 15th (last quarter moon) 20th and 21st heavy rains; a gale of wind on 21st from the south-west, which did much mischief

to the shipping in Gage's roads, light rains on the 22d, 23d, 24th, 25th 27th, 28th, 29th, 30th and 31st; winds N. W. and S. W.

	Max.	Med.	Min.
Thermometer......	84	63¾	45
Barometer	30.30	29.82½	29.50

June.—Much rain with thunder on the 1st; it continued fine afterwards till 13th (last quarter of moon), on which day and 14th March rain fell; heavy rains on the 21st, 22d and 23d; slight rain on 27th; remainder fine. Hoar frost early in the mornings of 2d, 3d, and 4th; winds north-east, north-west and south-west.

	Max.	Med.	Min.
Thermometer......	70	55½	40
Barometer	30.15	29.82½	29.50

July.—Heavy on the 1st, 2d, 4th, 5th, 6th, and 7th. Ice, the thickness of a shilling, out of doors, on mornings of 10th and 24th. It rained daily from 13th to 22d, with the exception of 19th, which was new moon. It also rained on 27th and 28th; lightning and thunder on 7th and 13th. Heavy squalls with hail stones, thunder and lightning, on 15th. Winds N. E.—N. W.—and S. W.

	Max.	Med.	Min.
Thermometer......	65	51⅜	34
Barometer	30.20	29.91¼	29.62

August.—It rained much on fifteen different days viz. 4th to 10th, (last quarter of moon), 16th, 19th, 20th to 24th, and 31st, with squalls from north-west and south-west; remainder fine; prevalent wind S. W.

	Max.	Med.	Min.
Thermometer......	76	57¼	38
Barometer	30.35	30.07½	29.80

September.—Was warmer and drier than the preceding months, it rained on 1st, 2d, 9th, 14th and 19th. Winds N.—N. W.—and S. W.

	Max.	Med.	Min.
Thermometer......	80	59¾	44
Barometer	30.40	30.15	29.90

October.—Was fine with the exception of 1st, 2d, 7th, 8th, (last quarter of moon) 19th, 10th, 15th, 16th (new moon) 17th, 18th, 25th and 27th, on which days rain fell. Heavy squalls on the 9th; thunder

and lightning on 10th, 17th and 18th. Winds N. E. and S. W.

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	78	62¾	46	Barom.	30.35	30.02½	29.70

November.—Twelve fine days, twelve cloudy, six rainy, viz. 3d, 4th, 22d, 23d, 29th and 30th (full moon); much lightning and thunder on evening of 22d at first quarter of the moon; winds N. E. and S. W.

Therm.	93	71¼	54	Barom.	30.25	30.02½	29.80

December.—Hot and dry, with the exception of 10th, 22d, 23d, 24th and 28th, on which days rain fell in slight showers. The thermometer at 103° in the shade, and 123° exposed to the sun's rays on 17th. Winds N.—N. E. and S. W.

Therm.	103	81½	62	Barom.	30.20	30.00	29.80

The prevalent diseases of this year were dysentery, opthalmia, fever, catarrhs and scurvy. A mild form of dysentery was the disease most commonly met with; cases have occurred in each month, but it prevailed most in April, after the weather began to break, with heavy rains, thunder and lightning : the medium range of the thermometer for the month being 68½, that of the barometer, 29.95.

1831.—The character of the seasons was, on the whole, milder in 1831, than in 1830; the winter more temperate, the rains more equally distributed through the seasons, and the winds more moderate. No severe gale occurred ; during the summer the heat was less oppressive, and the medium range of the thermometer for the month of December five and a quarter degrees lower than the corresponding month of last year.

January.—Hot and dry, except on the 5th, 13th and 14th, when some slight showers fell, at the changes of the moon ; the 22d, 23d and 24th were very sultry, the thermometer rose in the shade to 102°, 104, and 106 at 2 P. M. on these successive days ; and when exposed to the sun to 123, 127 and 130. The wind was from the north the greater part of the month : this is the hot wind of the colony ; while it prevails, the weather is very sultry.

Therm.	106	82¾	68	Barom.	30.10	29.91¼	29.72½

Prevalent disease dysentery. During the month of February the regular land and sea breeze occurred almost daily ; thunder and light-

ning on 7th, 12th, 13th and 14th, with rain on 7th and 14th. A few cases of ephemeral fever and rheumatism were met with.

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	102	80½	62	Barom.	30.20	30.02½	29.85

March.—Was generally fine; some showers fell on 27th and 28th at full moon; the land and sea breeze very regular. In the early part of the month slight opthalmia appeared, towards the latter end, dysentery and fever.

Therm.	96	76¾	56	Barom.	30.20	30.02½	29.85

April.—Was fine for the greater part; the 10th, 29th and 30th cloudy and windy, with some rain; winds N. E. and S. W. The nights were cold. In the early part dysentery continued to prevail; about the middle and latter end scurvy.

Therm.	98	72½	48	Barom.	30.25	30.10	29.95

May.—Was variable with heavy rains on 5th, 6th, 7th, 8th, 14th, 18th (first quarter of moon), 19th, 20th, 21st and 22d, and dew at night. Winds N. E.—N. and S. W. Scurvy and catarrhs most commonly met with; also a few cases of pneumonia.

Therm.	78	63½	44	Barom.	30.40	30.15	29.70

June.—Was variable; the showers were frequent, but neither long continued nor heavy. Rain fell on 5th, 8th, 9th (new moon), 10th to 16th (first quarter), 17th, 21st, 22d and 23d; a severe thunder storm on the night of the 13th. Scurvy and catarrhs continued to prevail.

Therm.	70	58	38	Barom.	30.30	29.90	29.50

July.—Was fine with the exception of 4th, 5th, 6th, 7th, 8th, 15th, 16th (first quarter), 17th to 21st, 25th, 27th and 28th, on which days much rain fell. A severe thunder storm on the 8th, with a shower of hail. Ice was found out of doors about the thickness of a shilling on the morning of the 9th (new moon). Winds N. E.—N. W. and S. W. There was but little disease.

Therm.	67	54¼	53	Barom.	30.40	30.05	29.70

August.—A good deal of rain fell on 3d to 6th, 9th, 10th, 11th, 18th to 22d (full moon) 24th to 29th (last quarter). It blew very fresh on the 5th, but there was not any such severe gale as occurred last winter. Winds N. E. and S. W. Catarrhs sometimes met with.

Therm.	76	59¼	42	Barom.	30.40	30.10	29.80

September.---Thunder on 2d, 10th and 19th; mostly cloudy and showery on 2d, 3d, 4th, 7th, to 11th, 16th, 18th, 19th and 22d. Winds N. W.—S. W. and N. E. A few cases of ephemeral fever and catarrh.

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	78	62¼	45	Barom.	30.30	30.00	29.70

October.---Was cloudy and fine alternately; it rained on 7th to 13th (first quarter), 16th to 20th (full moon); remainder fine. Winds N. E. S. W. Catarrhs and ephemeral fever.

Therm.	79	63	48	Barom.	30.40	30.07½	29.75

November.---Was squally and rainy at beginning; latter part fine. It rained on 3d, 4th, 5th, 6th, 8th, 9th, 18th, 19th (full moon), and 27th. During the early part no diseases; during the latter opthalmia. The 25th was very sultry. Thermometer in the shade at 95°; exposed to sun 130°. Winds W. and W. by S.

Therm.	95	69¾	54	Barom.	30.15	29.90½	29.66

December.—Was generally fine, and cooler than the corresponding month of last year, the medium range of the thermometer for the month being 5¼ degrees lower; slight showers fell on 23d, 28th, 29th and 30th. Winds N. E. and S. W. The opthalmia which commenced in November continued throughout this month.

Therm.	96	76¼	60	Barom.	30.25	30.07½	29.90

The prevalent diseases of this year, were similar to those of the last, viz. dysentery, opthalmia, fever, catarrhs and scurvy.

1832.—The weather this year was more variable and damp than either of the two preceding; there were a greater number of rainy days, and the winds have been generally higher, though no severe gale has occurred.

January.—During the early part fine, the middle cloudy, latter fine; lightning on 4th and 6th, loud thunder on 31st; rain on 15th (full moon) and 31st. Winds N. E. and S. W. Ephemeral fever the prevalent disease.

Therm.	99	76¼	61	Barom.	30.10	29.95	29.80

February.—Fine with the exception of eight cloudy days, on three of which it rained, viz. 3d, 4th and 10th; thunder on 3d and 26th. Winds N. E. and S. W. Opthalmia prevalent.

Therm.	106	78¾	60	Barom.	30.10	29.97½	29.85

March.—Generally fine. Thunder on 4th, with heavy rains on 4th and 5th, and light rains on 6th, 19th and 30th. Winds N. E. and S. W. But little disease met with; a few cases of dysentery towards latter end.

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	95	$77\frac{3}{4}$	62	Barom.	30.20	29.90	29.60

April.—Was alternately cloudy, showery or fine, like April in England. It rained on 4th, 5th, 7th (first quarter of moon), 8th, 11th, 18th, 20th, 21st, 22d (last quarter of moon), 23d, 26th, 27th, 29th, 30th (new moon); a thunder storm on 8th. Winds N. E. and N. W. Dysentery the prevalent disease.

Therm.	92	71	50	Barom.	30.30	30.10	29.90

May.—Rain fell on 1st to 6th (first quarter of moon), 9th to 13th, 17th, 18th, 20th, 21st, 25th and 26th. A heavy squall from N. W. on 18th. Winds E. N. E. —N. W.—S. W. Rheumatism.

Therm.	77	61	46	Barom.	30.50	30.00	29.50

June.—It rained on 4th, 5th (first quarter of moon), 6th, 8th, 9th, 10th, 13th, to 17th, 21st to 25th. Hoarfrost and ice on 3d—a thunder storm, and large hail stones on 8th, with a heavy squall from S. W. Ephemeral fever.

Therm.	74	59	44	Barom.	30.60	30.20	29.80

July.—Was for the most part fine; it rained on 2d to 6th, 15th, 17th, 18th, 19th, 20th, 27th, 28th, 29th and 31st. Ice seen out of doors on mornings of 1st and 9th. Heavy squalls on 4th and 17th, attended by showers of large hail stones. Winds N. E.—N. W. and S. W. There was but little disease, chiefly catarrhs and rheumatism.

Therm.	70	$55\frac{1}{2}$	40	Barom.	30.35	$29.97\frac{1}{2}$	29.60

August.—Rain fell on the 1st, 4th, 8th, 12th, 18th (last quarter of moon), 19th, 23d, 29th, 30th and 31st; thunder storm on 11th. Heavy dew at night. Winds N. E. and S. W.

Therm.	79	$59\frac{1}{2}$	44	Barom.	30.30	$29,97\frac{1}{2}$	29.65

September.—Was cloudy, squally and rainy, much rain on 1st (first quarter of moon), and some on 2d, 3d, 4th, 6th, 7th, 12th, 13th, 14th, 15th, 18th, 20th, 21st, 22d, and 23d (new moon); thunder storm on 18th. Winds N. W. and S. W. Catarrhs, pleuritis and rheumatism.

Therm.	76	$61\frac{1}{2}$	50	Barom.	30.30	$29.97\frac{1}{2}$	29.65

October.—Was squally and showery during early part; the middle fine; latter end, squally and rainy. Ephemeral fever, with, derangement of the biliary system, and cholera morbus, the prevalent diseases. Some rain on 1st (first quarter of moon), 2d, 3d, 6th, 7th, 8th; much on 9th (full moon); some on 10th, 13th, 18th, 21st, 27th, 30th, and 31st (first quarter of moon).

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	76	$62\frac{1}{4}$	50	Barom.	30.25	$29.87\frac{1}{2}$	29.53

November.—A thunder storm and gale of wind, with heavy rain, on 1st; cloudy, showery and rainy on 9th: thunder storm on 10th; cloudy and showery on 18th, 19th, 20th, 21st, 22d and 23d; remainder fine. Wind S. W. Disease opthalmia.

Therm.	86	$64\frac{1}{2}$	52	Barom.	30.40	30.10	29.80

December.—Early part cloudy and showery, thunder storm on 4th middle fine, latter part squally and rainy, some rain on 1st to 5th, 10th, 30th and 31st. Winds N. E. and S. W. Cephalalgia and boils.

Therm.	101	75	60	Barom.	30.10	29.90	29.70

The total number of cases of disease have been about one-third less this year than the last, and nearly one half less than in 1830. The diseases most frequently met with have been fever, rheumatism, and opthalmia; occasionally catarrh and cynanche tonsillaris; dysentery but seldom, and scurvy has nearly disappeared.

1833.—The weather this year was variable and damp, though less so than the preceding.

January.—During the early part was cloudy, middle fine, except on 16th and 21st when there was thunder and heavy rains; latter end fine; nights cold and heavy dew. Winds S. W.—S. E. and N. E.

Therm.	99	$77\frac{1}{3}$	59	Barom.	30.20	30.00	29.80

February.—The early part cloudy and sultry, on 1st thermometer at 99° in the shade, exposed to the sun's rays 125°; middle fine, latter end cloudy; some rain fell on 8th, 14th, 27th and 28th; lightning and thunder on 14th, 18th and 26th. Winds S. W. and S. E.

Therm.	99	78	61	Barom.	30.20	30.00	29.80

March.—Fine till 6th, on which day there was lightning, thunder and some rain, thunder on 8th and 9th, much rain on 10th and 13th,

showery on 10th and 23d, squally on 15th, 19th and 29th, remainder fine. Winds N. E.—N. W.—S. S. W.

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	94	73	54	Barom.	30.40	$30.02\frac{1}{2}$	29.65

April.—Was alternately cloudy and fine, it rained on 2d, 7th and 24th. Heavy squall on 2d, hoarfrost of a morning at latter end. Winds N. E. and N. W.

Therm. 88 $67\frac{1}{2}$ 50 Barom. 30.40 30.17 29.95

May.—It rained on 2d, 3d, 4th (full moon), 5th, 8th, 9th, 10th, 19th (new moon), 20th to 25th and 31st; heavy squalls on 10th from N. E.; remainder fine. Winds N. E. and N. W.

Therm. 79 $64\frac{1}{4}$ 46 Barom. $30.42\frac{1}{2}$ $30.06\frac{1}{4}$ 29.70

June.—Much rain fell in this month, it rained on 2d (full moon), 3d 6th, 8th, 10th (last quarter of moon), 11th to 17th, 25th (full moon), to 30th; heavy squalls on 2d, from S. W. also squalls with thunder and lightning on 15th, 16th, 29th and 30th. Winds N. E.—N. W. and S. W.

Therm. 72 $58\frac{1}{2}$ 40 Barom. 30.50 29.95 29.40

July.—Was very wet—it rained on 1st, 2d (full moon), to 5th, 9th to 12th, 14th, 16th, 18th, 22d, 24th (first quarter of moon), 25th to 29th, and 31st; hail on 3d; heavy squalls from N. W. on 18th, thunder and lightning; and thunder with heavy rains on 27th. Winds N. and N. W.

Therm. 70 $59\frac{1}{4}$ 47 Barom. 30.40 30.10 29.80

August.—Rain on 1st, 2d, 6th, 7th, 8th, 9th (last quarter of moon), 13th, 14th, 15th, 16th (new moon), 19th, 27th, 28th, 29th, 30th, (full moon) and 31st, a thunder storm with heavy rain on 6th, on morning of 9th, heavy squalls from N. W. with lightning, thunder, hail and rain. Winds S. W.—S. E. and N. E.

Therm. 74 $58\frac{1}{8}$ 46 Barom. 30.45 $30.07\frac{1}{2}$ 29.70

September.—Beginning fine, middle cloudy and showery, latter end fine, some rain fell on 7th (last quarter of moon), 9th, 10th, 13th, 18th, 20th; (first quarter of moon), 21st, 24th and 30th; thunder and lightning with heavy rains on 24th. Winds N. W. and S.W.

Therm. 78 $60\frac{3}{4}$ 50 Barom. 30.40 30.10 29.80

October.—Early part fine, middle cloudy and showery, latter alternately cloudy and fine, rain on 9th, 10th, 11th, 12th, 16th, 17th, 19th and 31st. Winds S. W.

	Max.	Med.	Min.		Max.	Med.	Min.
Therm.	88	66½	51	Barom.	30.25	30.07½	29.90

November.—Early part generally fine, middle cloudy and showery, and also latter end ; rain on 8th, 14th, 18th, 20th, 21 st, 23d, 24th, 26th, 27th (full moon), 28th and 29th ; lightning on 14th, and lightning and thunder on 17th and 26th. Winds E. N. E. and S. W.

Therm.	91	70¾	54	Barom.	30.30	30.05	29.80

December.—Early part fine, middle cloudy and sultry, latter end fine ; rain on 1st, 27th (full moon), 30th and 31st ; lightning and thunder on 13th, 28th, 29th, 30th and 31st. Winds N.—N. E. and S. W.

Therm.	100	76	54	Barom.	30.30	30.05	29.80

The prevalent diseases of this year were catarrhs, hooping cough, and opthalmia ; cases of fever, dysentery and rheumatism were also occasionally met with.

TABLE OF METEOROLOGICAL OBSERVATIONS.

Year 1830.	Thermometer. Max.	Thermometer. Med.	Thermometer. Min.	Barometer. Max.	Barometer. Med.	Barometer. Min.	No. of days on which any rain fell.	Quantity of rain.
January......	0	0	0	0	0	0	0	0.926
February......	0	0	0	0	0	0	0	0.394
March........	88	73½	58	30.30	30.05	29.80	3	0.729
April.........	87	68½	54	30.30	29.95	29.60	9	1.087
May..........	84	63¾	45	30.15	29.82½	29.50	13	6.385
June..........	70	55½	40	30.15	29.82½	29.50	7	2.653
July.........	65	51⅛	34	30.20	29.91¼	29.62½	17	9.091
August......	76	57¼	38	30.35	30.07½	29.80	15	5.280
September....	80	59¾	44	30.40	30.15	29.90	5	1.634
October.......	78	62¾	46	30.35	30.02½	29.70	12	3.030
November	93	71¼	54	30.25	30.02½	29.80	6	0.928
December	103	81½	62	30.20	30.00	29.80	5	0.005
Year 1831.								32.142
January......	106	82¾	68	30.10	29.91¼	29.72¼	3	
February......	102	80½	62	30.20	30.02½	29.85	2	
March........	96	76¾	56	30 20	30.02½	29.85	2	
April.	98	72½	48	30.25	30.10	29.95	3	
May......	78	63½	44	30.40	30.15	29.70	10	
June..........	70	58	38	30.30	29.90	29.50	14	
July.........	67	54¼	33	30.40	30.05	29.70	15	
August........	76	59¼	42	30.40	30.10	29.80	18	
September....	78	62¼	45	30.30	30.00	29.70	12	
October.......	79	63	48	30.40	30.07½	29.75	11	
November	95	69¾	54	30.15	29.90½	29.66	9	
December	96	76¼	60	30.25	30.07½	29.90	4	

Meteorological Observations, continued.

Year 1832.	Thermometer. Max.	Thermometer. Med.	Thermometer. Mi.	Barometer. Max.	Barometer. Med.	Barometer. Min.	No. of days on which any rain fell.	Quantity of rain.
January	99	76¼	61	30.10	29.95	29.80	2	
February	106	78¾	60	30.10	29.97½	29.85	3	
March	95	77¾	62	30.20	29.90	29.60	5	
April	92	71	50	30.30	30.10	29.90	15	
May	77	61	46	30.50	30.00	29.50	17	
June	74	59	44	30.60	30.20	29.80	16	
July	70	55½	40	30.35	29.97½	29.60	14	
August	79	59½	44	30.30	29.97½	29.65	10	
September	76	61½	50	30.30	29.97½	29.65	15	
October	76	62¼	50	30.25	29.87½	29.50	14	
November	86	64½	52	30.40	30.10	29.80	9	
December	101	75	60	30.10	29.90	29.70	7	
Year 1833.								
January	99	77⅛	59	30.20	30.00	29.80	2	0.004
February	99	78	61	30.20	30.00	29.80	4	0.090
March	94	73	54	30.40	30.02½	29 65	7	0.602
April	88	67½	50	30.40	30.17½	29.95	3	0.125
May	79	64¼	46	30.42½	30.06¼	29.70	15	4.025
June	72	58½	40	30.50	29.95	29.40	18	9.353
July	70	59¼	47	30.40	30.10	29.80	20	6.511
August.	74	58⅓	46	30.45	30.07½	29.70	16	3.744
September	78	60¾	50	30.40	30.10	29.80	9	1.405
October	88	66½	51	30.25	30.07½	29 90	8	0.546
November	91	70¾	54	30.30	30.05	29.80	11	0.354
December	100	76	54	30.30	30.05	29.80	4	0.076
								26.925

TABLE OF DEATHS, MARRIAGES, AND BIBTHS, AT PERTH.

YEAR 1830.		YEA 1831.		YEAR 1832		YEAR 1833.	
DEATHS.		DEATHS.		DEATHS.		DEATHS.	
Disease.	*No.*	*Disease.*	*No.*	*Disease.*	*No.*	*Disease.*	*No.*
Fever	14	Fever	3	Dysentery.	1	Fever.	1
Scurvy	13	Scurvy	3	Apoplexy	1	Dysentery	2
Dysentery	10	Dysentery	4	Drowned	1	Apoplexy	1
Dropsy	3	Epilepsy	1	Hanged himself	1	Excessive drinking	1
Apoplexy	1	Disease of heart	1			Pneumonia	2
Marasmus	4	Apoplexy	1			Consumption	2
Drowned	3	Marasmus	2			Hooping cough	1
Consumption	1	Convulsions	1			Thrush	1
Excessive drinking	1	Drowned	7			Croup	1
		Excessive drinking	1			Childbed	1
						Tabes mesenterica	1
Total	50		24		4		14

Total marriages at Perth, from 1830 to 1833 inclusive................32
Total baptisms at do. from 1830 to 1833 do. 130

TABLE of DEATHS, MARRIAGES, and BIRTHS, at FREEMANTLE.

YEAR 1830.		YEAR 1831.		YEAR 1832.		YEAR 1833.	
DEATHS.		DEATHS.		DEATHS.		DEATHS.	
Disease.	*No.*	*Disease.*	*No.*	*Disease.*	*No.*	*Disease.*	*No.*
Dysentery	10	Scurvy	12	Apoplexy	2	Convulsions.	2
Scurvy	10	Dysentery	3	Dysentery	1	Speared by natives	2
Consumption	1	Consumption	1	Scurvy	1		
Dropsy	1	Killed by natives.	1	Consumption	1		
Childbed	2			Cancer in womb	1		
Killed by natives.	1			Killed in a duel	1		
				Drowned	4		
				Hanged himself	1		
Total	25		17		12		4

Total marriages at Freemantle, from 1830 to 1833 inclusive..........21
Total baptisms at do. from 1830 to 1833 do. 24

I am indebted to the Rev. J. B. Wittenoom, the Colonial Chaplain, for the foregoing tables of deaths, marriages and births, which were copied from his Register. They will give some idea of the prevailing diseases and mortality for each year, with the gradual decrease of sickness as the colony advanced. These tables however can only be looked upon as an approximation to the truth, as in the early state of a new colony, it was difficult to obtain correct information in all cases. They include settlers, soldiers, women and children.

The Colonial hospital being at Perth, all the worst cases of disease amongst the poor were sent into it from all parts of the colony: consequently the deaths were more numerous there than at Freemantle.

IX.—*Account of the Construction and Operation of an Experimental Self-registering Barometer.*—*By* Wm. Gilchrist, *Esq. of the Madras Medical Establishment.*

In my communication respecting the Self-registering barometer published in No. 16 of the Journal, page 68, I mentioned with respect to the float which regulates the motion of the tube, that, "if this float "be sufficiently large to buoy up the tube, the balance part of the ap- "paratus may be laid aside altogether, and the weight below the cis- "tern, acting on the principle of *ballast*, will preserve the tube in the "perpendicular." I have fitted up a barometer on this principle. It has been in operation the last two days, and I have the pleasure to state that it proves most satisfactorily the correctness of the principle stated in the above quotation. I fear that a sketch of a plan of a barometer on this principle, could not be lithographed in time for the issue of No. 17, of the Journal now due, otherwise would send one. In the mean time, however, it will be satisfactory to those who wish well to the advancement of meteorology, to be informed that a barometer, of so simple a construction as the one alluded to, can be made, that will, with scientific correctness, make a perpetual record of the varying pressure of the atmosphere.

In fitting up the barometer referred to, I purposed merely to test the correctness of the principle, without reference to accuracy in the details of construction—in other words simply to ascertain whether the instrument would *work*. The tube portion consisted of a four-ounce glass stopper vial, by way of expanded top, cemented by means of bees' wax to a common barometer tube, the closed end of which was previously cut off. Presuming that those who interest themselves in meteorology would desire to test this principle, in the like easy manner, I will mention somewhat in detail the fitting up of the instrument, as otherwise one or two failures may occur before success be attained. In order to cement the vial and tube together, the mouth of the former and one end of the latter ought to be coated with melted wax—when cold, the tube is to be pushed about half an inch into the mouth of the vial and retained perpendicularly—then about four inches of the tube and one inch of the vial are to be coated with wax—applied in the fashion of paint—and when one is cold, successive coats are to be applied, until a body of wax has accumulated, sufficiently strong to keep the vial and tube firmly attached. It is essential to apply the wax coat after coat in the manner stated—as I found the applying it in the manner of *casting* did not make an air-tight joint. When the wax is

quite cold, this tube is to be fitted into a piece of wood, in which a groove is cut to receive it—the vial part being received into a sort of cup formed in the expanded upper part of the wood. To the lower end of this, the float (also consisting of wood turned on a lathe to the requisite size) is to be attached; and through the middle of it the glass tube must descend to a level with the lower end. The wood and glass are attached by means of wax, and it is necessary to coat the float with the same, to prevent the mercury entering the pores of the wood.

About a foot above the float a cross piece of wood was fixed horizontally, and from either end of this a wooden rod descends about four feet—these rods ought to admit of being easily and firmly attached to, or removed from, the rest of the apparatus. They support the wooden shelf on which to place the weights which act as *ballast*, and it ought to be broad to admit of moving the weights into the position that will cause the whole instrument to float perpendicularly. The vial ought to be filled with mercury before the tube is cemented to it—however, this is not essential, as the mercury can easily be introduced down the tube—care must be taken, however, to incline the tube as the mercury rises in this, otherwise the great hydrostatic pressure may burst the vial. The cistern which holds the mercury may easily be made out of a common beer bottle, by cutting off the top narrow portion with a red hot iron. The upper part of the float is considerably smaller than the lower, with the view to admit of the indications being magnified.

Compared hourly with a common barometer, the two rose and fell simultaneously, but not regularly. This of course arose from the unequal diameter of the vial, and the irregular contour of the float—it was intended that the indications should be magnified five times—but at some hours the indications were greater, at others less, than those dimensions—this irregularity of course arose from the cause just mentioned—but, as already stated, all I contemplated, was merely to ascertain whether a barometer on this principle will work, which was proved most satisfactorily.

This instrument, compared with the balance variety, recommends itself for its great comparative simplicity of construction.

The plan of bringing the centre of gravity below the float, would be advantageously introduced in the variety of barometer shown by fig. 2, plate 15, in the 14th Number of this Journal.

Hoonsoor, *5th October*, 1837.

X.—*Horary Meteorological Observations made at the Equinoxes and Solstices, agreeably with the suggestion of Sir* JOHN HERSCHEL.

1*st.—At the Trevandrum Observatory.—By* J. CALDECOTT, Esq.

Date.	Hour.	Bar. corrected for tempr. 32.	Thermometer	Depress of W. B. therm.	Dew point.	Direction of wind.	Velocity of do	Solar radtn.	Clouds, aspect of the sky and remarks.
Sept. 21	6 A. M.	29.978	74.0°	1.3°	71.73°	N N E ½ F	2.	—	Fl. cl. in zen.—light cum. about the horizon—fair—light air.
	7	29.993	75.5	1.0	74.09	do	1.	6.6	Zenith clear do do
	8	30.008	78.9	3.3	74.27	N N E	1.	4.5	do do do
	9	30.044	81.5	4.6	75.10	do	2.	9.6	Fl. light cls. in zen.—loose cum. about horizon.
	10	30.047	82 5	5.5	74.85	s w by w	2.	5.75	Heavy cum. dispersed—light air.
	11	30.029	83.5	7.0	73.68	s w	4.	4.65	do about N. & E. hor. gent. wind.
	Noon	30.001	84.5	7.8	73.57	s	5.	6.3	do do threatening—thunder from N.E,—heavy rain at half past twelve.
	1 P.M.	30.001	81.0	4.7	74.43	s by w	7.	Obscured.	Thunder and rain continued—squalls from S. by E.
	2	30.000	76.5	2.7	73.69	s E	4.		do. do.
	3	29.998	77.4	0.7	76.43	s s E	1.		Sky very cly.—wind hardly perceptible.
	4	29.992	77.9	1.9	75.25	do	4.		do. gentle wind.
	5	29.922	79.0	2.3	74.78	do	4.		do. do.
	6	29.929	77.7	2.1	74.76	do	4.		Sky hazy do.
	7	29.950	76.9	1.5	74.80	do	3.		Zenith clear—horizon very hazy—gentle breeze—lightng. in E.
	8	29.981	76.2	1.3	74.37	do	3.		do cls. and lightning about the N. W. and E. horizon.
	9	29.992	75.5	1.3	73.65	do	1.		do. wind hardly perceptible.
	10	30.007	75.6	1.3	73.76	do	2.		do. do. do.
	11	30.005	75.3	1.3	73.45	do	2.		do. do. do.
	Midn.	30.004	75.0	1.4	73.00	do	2.		Sky very hazy—lightning. N.
22	1 A.M	29.990	74.8	1.8	71.81	do	2.		Sky very cly.—wind just perceptible.
	2	29.976	74.5	1.5	72.34	do	2.		do. lightng. about S.E. horizon.
	3	29.959	74.0	1.7	71.53	do	2.		do. do. about E. horizon.
	4	29.954	74.0	1.8	71.38	do	2.		do. lightning from S. E.
	5	29.959	73.5	1.4	71.46	do	1.		Cum. and stratus dispersed—lightng. all round the horizon.
	6	29.979	73.8	1.2	71.97	do	1.		Overcast and threatening thunder from N. E.—wind hardly perceptible—rain at half past 6.
	7	29.998	74.0	0.9	72.70	do	2.	Obscured.	Rain continued--obscured--wind just perceptible.
	8	30.020	74.6	0.6	73.74	do	2.		Heavy cum. about the horizon—zenith very hazy—wind just perceptible.
	9								
	10	30.027	77.3	1.0	75.91	do	2.	2.4	do. do.
		30.028	80.0	4.3	73.96	do	1.	2.9	do. wind hardly perceptible.
	11	30.019	82.5	4.9	75.71	do	2.	3.1	Light cum. about the hor.—do.
	Noon	30.009	84.0	5.4	76.91	s by E	2.	7 8	Cum. dispersed in the zen.--wind just perceptible.
	1 P.M.	29.933	84.4	5.8	76.34	s by w	4.	9.6	Fl. cls. in zen.—cum. about the E. and N. horizon—thunder.
	2	29.932	82.9	5.5	75.27	s	4.		Sky very cloudy—gentle wind—drizzling rain and thunder.
	3	29.910	80.4	3.3	75.83	s	3.	Obscured.	do. threatng.—do.—thund. cont.
	4	29.926	80.5	3.5	75.65	s	3.		Nimbus in several parts—drizzling—thunder and lightning.
	5	29.927	80.5	3.7	75.37	s	4.		Lightning in the S. W. horizon.
	6	29.942	78.8	2.8	74.89	w	3.		do. do.

Fall of rain from 6 P. M. 20th to 6 A. M. 21st..	None.	Total in 36 hours .8652 inches.
do. 6 A. M. 21st to 6 P. M. 21st..	.7326	
do. 6 P. M. 21st to 6 A. M. 22d ..	.0042	
do. 6 A. M. 22d to 6 P. M. 22d ..	.1284	

Instruments the same, and are placed in the same situation, as described before.

2d.—At Hoonsoor, in Mysore.—By Wm. Gilchrist, *Esq. of the Madras Medical Establishment.*

Day.	Hour.	Dry thermometer Fahrenheit.	Wet thermometer.	Barometer.	Winds.	Clouds, &c.	Remarks.
Sept. 21	$6\frac{1}{4}$ A. M.	70	68	27.480	Calm	Zenith nearly clear—horizon cum-strati.	Heavy dew.
	7	71.75	68.5	.500	N. by E. light breeze	do. cumuli do. clear.	A rainbow on cloud near zenith.
	8	73.75	68.75	.520	N. E. by E. do	Thin cumuli and cirri over hemisphere.	
	9	76.25	69.5	.530	N. E. do	Cumuli over greater part of do.	
	10	78	69.5	.536	E. do	do. do. do.	The cumuli have ragged edges showing an electrical state.
	11	80.5	70	.536	N. E. do	Zenith cumuli—horizon all round cum-stra ti.	do. do. do.
	12	83	70	.510	E. by N. do	Detached large cumuli over hemisphere.	
	1 P. M.	86	71.5	.480	E. by N. breeze	do. do. do.	
	2	85	68	.462	do. do	do. do. do.	The cumuli ragged at edges.
	3	87	69.75	.444	E. do	do. do. do.	
	4	86.75	69	.424	E. by S. light do	Zenith detached cumuli. horizon cum-strati.	Cumuli as at 2.
	5	87	69	.414	N. E. breeze	do. do. do. do.	An upper and lower stratum of cloud; the latter highly electrical—rain to eastward.
	6	72.5	66.5	.424	S. W. light do	Nimbi.	$5\frac{1}{2}$ P. M. strong wind from E. with rain in large drops—6 P. M. wind suddenly changed to S. W. at first strong and puffy, afterwards light breeze.
	7	76.5	69	.414	Calm	Zenth clear—S. W. horizon nimbi.	7 P. M. lightning almost continuous in W. horizon—no thunder heard.
	8	74.5	69	.412	W. light breeze	Nimbi.	Heavy rain—thunder over head.
	9	74	70	.488	W. air	do.	
	10	74.5	70.5	.484	W. light breeze	Zenith clear—W. horizon dark cum-strati.	
	11	72	70	.464	W. air	do. do. a few cum-strati.	
	12	71	69.5	.470	W. do	do. do. do. do.	
22	1 A. M.	73.5	70	.484	W. do	Clear.	
	2	69.5	69	.462	W. do	Dense fog.	The fog supervened rather suddenly.
	3	69	68	.450	W. do	do.	
	4	68	67.5	.440	W. do	do.	

Day.	Hour.	Dry thermometer. Fahrenheit.	Wet thermometer.	Barometer.	WINDS.	CLOUDS, &c.	REMARKS.
Sept. 22	5	69	67	.450	Calm	Zenith clear, less fog around horizon.	
	6	70.25	68	.450	do	Fog.	
	7	71.5	67	.490	do	do.	
	8	70.25	68	.512	do	do.	
	9	74.5	70.5	.532	S. by E. light breeze	Zenith a few thin cumuli—horizon cum-strati.	
	10	76.5	71	.532	do do do	do. cumuli with ragged edges—horizon cum-strati.	
	11	79	72.5	.540	S. E. breeze	do. do. do. do. do	Shadow on horizontal plane 2,280 inches, the perpendicular wire being 6 inches long.
	12	81	70.5	.528	do do	do. do. do. do. do.	
	1 P. M.	82	69.5	.492	E. light breeze—puffy	do. do. do. do. do.	
	2	84	68.75	.462	N. E. do do	do. clear—horizon cum-strati.	do. 3.450 inches.
	3	84.75	69.5	.440	do do do	do. do. do.	
	4	84.5	67.5	.442	S. E. do do	do. do. do.	
	5	84.25	68.25	.436	N.E. do	do. do. do.	
	6	81.5	68.25	.406	Calm	do. cirri—do. do.	

Total quantity of rain during the period of observations 0.6 inch. The instruments with which the above observations were made, are the same as those used in June last, so that the remarks respecting their position, relative correctness, &c., as given with the June observations in the 16th No. of this Journal, apply equally to the above.

☞ The absence of the Astronomer from Madras has caused the omission of the Madras hourly observations.—EDITOR.

XI.—*Monthly Abstract of the Daily Atmospherical Register, kept at Merkara in Coorg, from 1st June 1836 to 31st May 1837.*

	Mean ther.		Mean barometer at 10 A. M. corrected.	Mean of hygrometer at 10 A. M.					Total fall of rain.	Prevailing winds.	General Remarks.
	At 6 A. M.	At 10 A. M.		Wet bulb.	Diff.	Quantity of moisture.	Dryness.	Dewpoint.			
1836 June	62	68	25.980	19.1	1.6	226.4	45	17.2	20.84	W. N. W.	The monsoon was later than usual on setting in, and can hardly be said to have begun till the 19th. The quantity of rain also does not amount to half the fall in the corresponding month of last year. For a considerable portion of the month, the air has been so saturated with moisture, as to afford no indication by the hygrometer. The troops continue (as usual at this season) very healthy.
July	62	64.6	26.025	Saturated.					23.73	W. N. W.	The monsoon has continued without intermission during the month, and the weather has been most disagreeable, exercise being almost totally precluded. The troops are very healthy, out of the 12 cases in hospital, 9 are accidents.
August	60	63	26.020			Do.			24.74	W. N. W.	The monsoon has continued without intermission throughout the month, with almost constant rain or fog, and high winds, the air being intensely damp and the sun scarcely ever visible. The troops continue extremely healthy.
Sept.	62	67	26.075	17.2	1.6	205.4	33	15.6	7.02	W. N. W. N. N. W.	The monsoon continued, but with diminished violence, when the weather cleared up, and has since been fine and clear with occasional fogs, and a few thunder storms. The wind is drawing gradually round the northward, and the nights are becoming cold. A few cases of rheumatism and fever, among natives have presented themselves, attended with determination to the head and chest—this is usual in all changes of weather.
October	63	68	26.125	16.1	6.1	149.4	129.6	8.7	0.55	NW. NE.	The weather during this month has been unusually fine, dry and clear, with high cold winds from the N. E. so much so as to occasion apprehensions of a deficiency of water for cultivation—The number of cases of slight fever, and rheumatism among the natives has also, as usual in sudden changes of weather, considerably increased—but they are generally mild, and yield to the usual simple remedies,

Nov.	60	70	26.120	15	7.2	128	151	5.4	1.55	E. NE.	The north-east monsoon may be said to have almost failed in this quarter. The weather during the month, except a few casual showers, has been clear, dry and cold. Fevers are becoming less frequent, and the troops are in general healthy.
Dec.	58	70	26.180	12.2	7.8	97.6	154.4	1.5	0.07	NE.	The weather during the whole of this month, with the exception of two light showers, and occasional fogs, has been dry and clear, the mornings and evenings cold, with, towards the latter part, storms of wind from the E. and N. E. The troops continue very healthy—a few cases of rheumatism and fever of a slight description notwithstanding.
1837. January	56	69	26.175	11.6	7.2	98.9	139.5	0.3	None	NE.	The weather during the past month has been uniformly clear, cold and dry, with very high cold winds. The number of cases of fever has somewhat increased, with a tendency in some instances to congestion in the lungs.
Feb.	60	74	26.210	15	8.8	112	188.4	2.5	None	E. E. N.E	The weather throughout this month has been intensely dry, and latterly very warm. The season being more than 6 weeks earlier than usual, the scanty monsoon of last year now begins to be severely felt, causing drought all over the country. The troops continue healthy.
March	64	76	26.170	16.4	8.9	124	197	4.6	1.29	Variable.	The weather during this month has been unusually close and hot, at least 6 weeks in advance of the two preceding seasons—water very scarce in many places. A considerable number of cases of fever, with determination to the chest, occurred after the showers on the 5th and 6th; since which the troops have been as usual healthy.
April	65	78	26.130	18.3	9.3	139	218	7.2	0.21	Do.	This month has been warm and pleasant; but few showers have fallen, which is unusual at this season.
May	63	72	26.070	20	4.1	211	93	16.2	7.64	N. W WN. W.	The early part of the month was warm and close with a few heavy showers. The monsoon set in on the 25th (unusually early) with a heavy thunder storm, but as yet only a small quantity of rain has fallen. As usual at this season, slight fever and bowel complaint have been common among the followers and prisoners in the jail, but have not prevailed among the military.
General means.	61.25	69.91	26.106			Total rain 87.04					

ROBERT BAIKIE,
Surgeon, 36th Regt. N. I.

XII.—Selections.

1.—*On a portion of Dukhun, East Indies.—By Lieutenant-Colonel* W. H. Sykes, F. R. S. F. G. S. F. L. S.

My personal observation of Dukhun (Deccan) and Konkun (Concan)* is not confined to the boundaries laid down in the following geological memoir ; but as the rock and mineral specimens remaining at present in my possession are from Dukhun only, I have not thought it proper to extend my details beyond the limits I here prescribe to myself, although I might venture to do so from notes taken at different periods, without exposing my accuracy to question. I will, however, in closing this paper, offer a few observations on the trap and other formations of India ; the amazing extent of the former not appearing to have been appreciated hitherto in European geological works.

Boundaries.—My tract† is bounded on the west by the range of mountains usually denominated by Europeans the "Ghats," from a misinterpretation of the term *ghat,* which simply means a pass, the proper name of this range being the "Syhadree ;" on the north by the Mool river, as far as Rahooreh ; on the east by a direct line from Rahooreh to the city of Ahmednuggur, and subsequently on the north-east by the Seena river until its junction with the Beema river below Mundroop ; on the south-east by a line from Mundroop to the celebrated city of Beejapoor ; on the south by a line from Beejapoor, to the town of Meeruj ; and from this place the boundary in the south-west is the Kristna and Quina rivers, to the hill fort of Wassota, situated in the ghats. The western boundary line extends, as the crow flies, about 144 miles ; the northern 72 miles ; eastern and north-eastern 159 miles ; south-eastern 41 miles ; southern 80 miles ; and south-western 88 miles. Agreeably to observations made by myself and the officers of the revenue survey in Dukhun, the tract lies between the parallels of north latitude 16° 45′ and 19° 27′, and east longitude 73° 30′ and 75° 53′, and, roughly calculated, may be said to comprise an area of about 26,000 square miles.

* With respect to the pronunciation of native words, the "*u*" is the *u* in "hut," and he "*a*" the *a* in "*all.*"

† See Map, Plate 7.

Printed at the Govt. Litho. Press.

Stratification.—Previously to entering into descriptive details, I will state, in a few words, that the whole of the country comprised within my boundaries is composed of distinctly stratified trap rocks, without the intervention of the rocks of any other formation. Whether at the level of the sea, or at the elevation of 4500 feet, in all and every part, beds of basalt and amygdaloid are found alternating, whose superior and inferior planes preserve a striking parallelism to each other, and, as far as the eye can judge, to the horizon. Barometrical measurements and the course of rivers indicate a declination of the country to the east-south-east and south-east. From the town of Goreh, latitude 19°-03 and longitude 74°-05, on the Goreh river, following a mean course for the river until it falls into the Beema, and subsequently, continuing a mean course for the Beema until its junction with the Seena river, the distance is about 200 miles, and the declination 671 feet: there may therefore be a trifling dip of the strata; but as a succession of low terraces occur in that distance, the apparent horizontal position of the strata may be unaffected by the above difference of level.

Dr. MacCulloch, describing the over lying or trap rocks, says, " these masses are generally irregular, but sometimes bear indistinct marks of stratification."* As Dr. MacCulloch's language implies the *rare occurrence* of stratification, instead of its being a distinctive feature, at least of the Indian branch of the trap family, I deem it necessary to quote the few authors who have written on Indian geology, in confirmation of the fact I have stated.†

* Classification of Rocks, p. 466.

† " These mountains (the Vindhya range), like every other in Malwa, appear to be distinctly stratified, consisting of alternate, horizontal beds of basalt or trap and amygdaloid. Fourteen of these beds may in general be reckoned, the thinnest at the top, and rapidly increasing in thickness as they lower in position, the basalt stratum at the bottom being about 200 feet thick." Again, at page 327, he says : " In the upper plains of Malwa every point of view presents the same uniform and distinctly streaked appearance noticed in the Vindhya range."—*Captain Dangerfield, in Geological Notices of Malwa,* in Appendix No. 2. to Sir John Malcolm's Central India, pp. 322, 327.

Dr. Voysey, in a paper on the Geological and Mineralogical Structure of the vicinity of Nagpoor, says : " From the summit of the hill of Sitabaldi the difference in the outline of the rocks eastward is very perceptible. The *flattened summits* and *long flat outline*, with the numerous gaps of the trap hills, are exchanged for the ridgy, peaked, sharp outline of the primary rocks."—*Physical Class of the Asiatic Researches*, p. 127.

In a second paper in the same work, on some petrified shells in the Gawelghur range of trap mountains, extending for 165 miles along the left bank of the Tapty river, from its source to the city of Boorhanpoor, he describes the principal part of the range as formed of " compact basalt very much resembling that of the Giant's Causeway. It is found

Ghats.—The Dukhun rises, by a succession of terraces or steps, very abruptly from the Konkun.* Its valleys and table-lands have a mean elevation above the sea of about 1800 feet. The Konkun is a long strip of land from thirty to fifty miles in breadth, lying between the ghats and the sea; the mean elevation of this strip is less than one hundred feet; but it is bristled with isolated hills, or short ranges, some of which attain an elevation equalling that of the ghats. Numerous shoulders or salient angles are thrown out from the ghats from the western or Konkun side, and by means of these the ascent to Dukhun is effected; with what difficulty, will be understood when I state that the military road of communication between Bombay and Poona, up the Bore ghat, rises nearly six hundred feet in a mile. The western portion of my tract along the crest of the ghats is exceedingly strong: spurs of different lengths extend from the main range to the eastward and south-east, leaving many narrow tortuous valleys between them, some of which have the character of gigantic cracks or fissures; other valleys, although occurring less frequently, when looked at from the neighbouring ranges, appear as flat and smooth as a billiard-table, even to the crest of the ghats, but when traversed are found to be cut up by numerous narrow and deep ravines.† Stupendous scarps, fearful chasms, numerous waterfalls, dense forests, and perennial verdure, complete the majesty and romantic interest of the vicinity of the ghats. As the spurs extend to the east and south-east they diminish in height, until they disappear on approaching the open plains in my eastern limits, between the Beema and Seena rivers. The area of the table land on their summit often exceeds that of the valley between them: such is the case with the spur bordering the left bank of the Beema river for forty miles from its source, occupying, in fact, the whole country between the sources of the Beema and Goreh rivers. The spurs are rarely tabular for their whole length, but narrow occasionally into ridges capped with compact basalt, and subsequently expand into extensive table-lands. The spur originating in the hill fort of Hurreechundurghur affords a good example. The fort is about eighteen miles in circumference: on the east it presents a salient angle to the neighbouring mountain; absolute contact, however, only commences at about four hundred feet from the top of the scarp, leaving

" columnar in many places, and at Gawelghur it appears *stratified;* the summits of several " ravines presenting a continued stratum of many thousand yards in length."—*Physical Class of the Asiatic Researches*, p. 189.

* See Plate 9.

† The valley of the Malsej ghat, for instance.

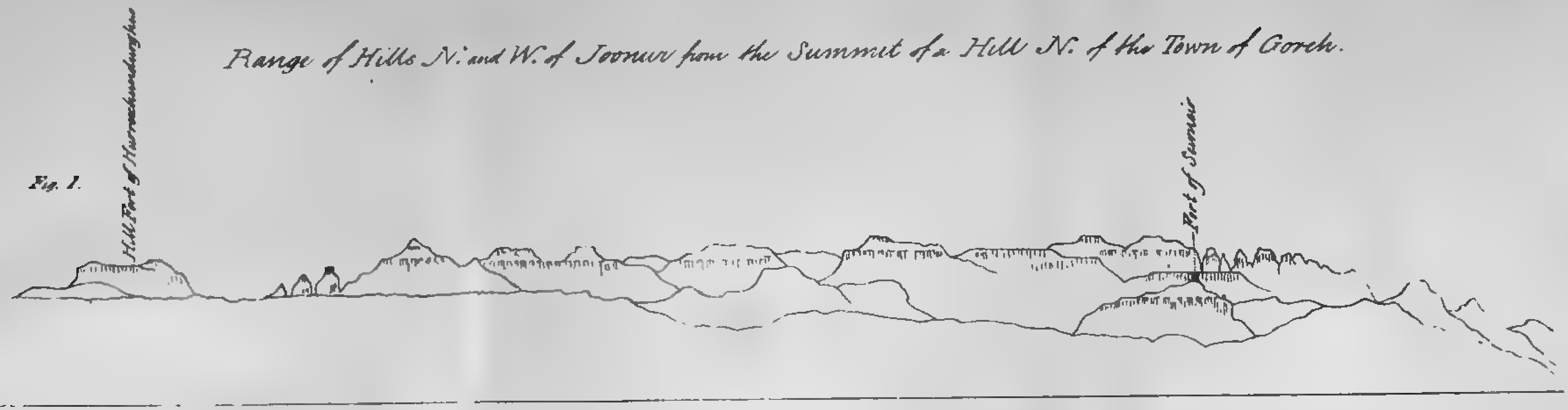
* See plate 9, fig. 1 and 2 on the Konkun ; and Plate 8, fig. 1.

† Physical Class, Asiatic Researches, p. 189.

PANORAMIC SKETCHES.

Range of Hills N. and W. of Joonur from the Summit of a Hill N. of the Town of Goreh.

Fig. 1.



N. b. E. Range of Hills as seen from Lakungaow in the Valley of Joonur.

Fig. 2.

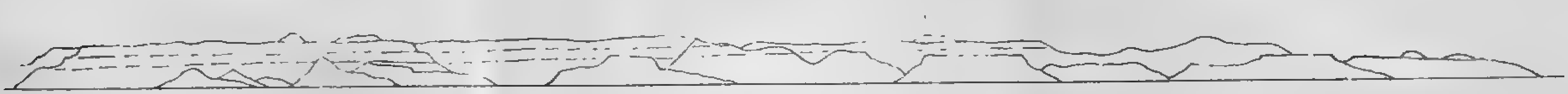
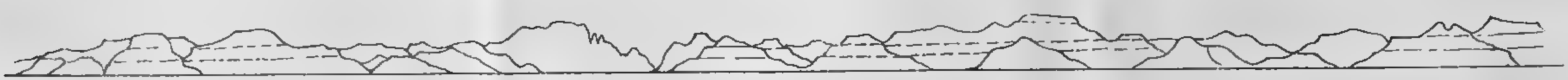


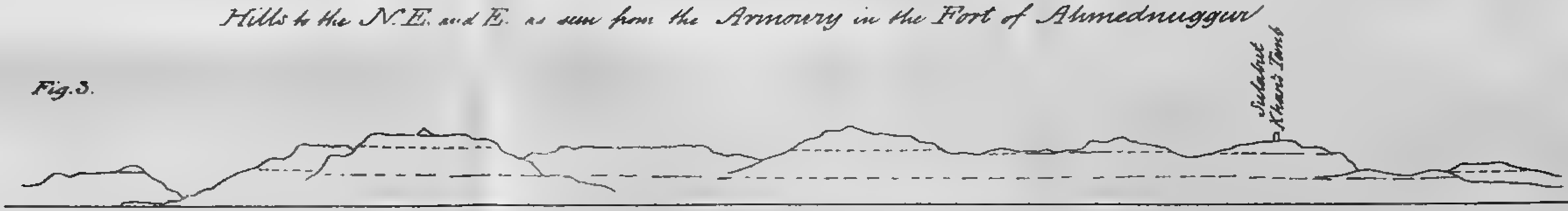
Fig. 2. Continued from the N. to the W.

*Fig. 2**



Hills to the N.E. and E. as seen from the Armoury in the Fort of Ahmednuggur

Fig. 3.



Northern Flank of the Plateau on which the City of Ahmednuggur Stands as seen from Wamooree.

Fig. 4.

a gap and an extremely narrow ridge, over which lies a difficult foot-path of communication between the valley of the Malsej ghat and that of the Mool river. The spur then widens; some lateral ramifications shoot out, on one of which is situated the fort of Koonjurghur; at the Brahmun Wareh pass it narrows considerably, but not into a ridge; it subsequently expands into the extensive and well-peopled table-land of Kanoor and Parneir, twenty-four miles long by twenty broad, having diminished in height, by a succession of steps, from 3894 feet in Hurreechundurghur to 2866 at Brahmun Wareh, 2474 at Parneir, and 2133 on the terrace of Ahmednuggur. From Ahmednuggur the spur bends southward until it is finally lost in the neighbourhood of Sholapoor. It is, in fact, the margin of a great plateau, which has a mean elevation of about three hundred feet above the valley of the Godavery river, and over which the rivers Goreh, Beema, Seena, &c., take their course. The basaltic caps of the ridges appear more or less columnar, from numerous vertical fissures; the weathering of these exposed rocks produces pillars, spires, towers, houses, and other forms of works of art.* Another feature of these spurs is the occasional occurence on their table-lands of small hummocks or conical hills with a truncated apex. Dr. Voysey† mentions "groups of flattened summits and isolated conoidal frustra" in the Gawelghur trap mountains.

One of the longest of the spurs originates in the ghats north-west of Satarah, and runs nearly east-south-east, about one hundred and ten miles, towards Punderpoor.

The spur immediately south of Poona, on the ramifications of which are situated the formidable fortresses of Singhur (4162 feet), Poorundhur (4472 feet), and Wuzeerghur, adjoining Poorundhur (at nearly the same elevation), has an extent of ninety-five miles. The accompanying section, Plate xxviii. fig. 2. represents this spur.

Valleys.—Much having been said respecting valleys of excavation, I think it may be acceptable to offer a few observations on the valleys between the spurs. I shall describe only those that present the greatest contrasts to each other.

Valley of the Mota river.—The valley of the Mota river, south of Poona, originating in a mass of hills on the edge of the ghats, is so exceedingly narrow, that for some miles the bases of the opposite hills

* See plate 9, fig. 1 and 2 on the Konkun; and Plate 8, fig. 1.

† Physical Class, Asiatic Researches, p. 189.

frequently touch each other, leaving, at intervals, little horizontal plots, of a pistol-shot in width. These plots occur in terraces, on lower levels as they extend eastward.

Vale of the Under.—The valley of the Under river, north-west of Poona, presents a perfect contrast to the last. It is level for twenty miles, running east and west to the very edge of the ghats, and a person can stand at the head of the valley upon the brink of a scarp rising almost from the Konkun. Here, at the source of the river, it is nearly six miles wide. The river Under runs down the valley one hundred and fifty feet below the level of the cultivated lands.

Vale of the Baum.—The neighbouring valley of the Baum river, unlike that of the Under, originates about seven miles from the crest of the ghats at a spot where the mountain masses separate into two spurs. Hence it continues level for fourteen miles, gradually widening eastward. The Baum river, like the Under, runs at a level of one hundred and fifty feet below the cultivated lands; these lands, in fact, being upon one terrace, the river upon a second and lower terrace.

Vale of the Beema.—The next valley on the north is that of the Beema river. The river rises on the elevated table-land above the ghats, at three thousand and ninety feet, and within the first few miles it tumbles over several terraces. The valley, for eighteen miles, is occasionally as narrow as that of the Mota river.

Vale of the Goreh.—Next on the north occurs the valley of the Goreh river, which, from the source of the river to Munchur (twenty-nine miles), is exceedingly narrow and tortuous. Here it expands into the broad horizontal plain of Kowta, ten miles wide.

Vale of the Malsej Ghat.—In conclusion, as a contrast to the first part of the Goreh valley, I must mention the valley of the Malsej ghat, on the south of the Dukhun-base of the fort of Hurreechundurghur. It is several miles wide, and literally as level, even to the brink of the ghats, as if smoothed by art. Many of the valleys of the ghats, particularly that of the Mool river, from the continued scarped character of the marginal mountains, and the flatness of the bottom for miles in extent, look like fosses to a Titan's fortress.

If all these valleys be valleys of excavation, the present rivers could scarcely produce such, were we to suppose their powers of attrition in operation from the origin of things even to the end of time!

Those of a fissure-like character might have resulted from the upheaving of the beds of trap from below the sea, and the consequent probable fracture of the surface ; but the same explanation will not apply to those valleys associated with the preceding, broad, flat, and margined by scarped mountains, which valleys are as wide at their origin at the crest of the ghats, and at the sources of the rivers which run through them, as in any part of their length.

Terraces.—As the rise from the Konkun to the Dukhun is by terraces, so the declination of the country eastward from the ghats is by terraces ; but these occur at much longer intervals, are much lower, particularly in the eastern parts, and escape the eye of the casual observer. In the neighbourhood of Munchur, on the Goreh river, there are five terraces rising above each other from the east to the west, so distinctly marked, that the parallelism of their planes, to each other and to the horizon, gives them the appearance of being artificial. An artificial character also pervades the form of many insulated hills : some of which viewed laterally, appear to have an extensive table-land on the summit, but seen endways look like truncated cones. Conoidal frustra in the Gawelghur range have been already noticed. Other insulated hills are triangular in their superficial planes, as the forts of Teekoneh(three-cornered) and Loghur.

Escarpments.—Stupendous escarpments are occasionally met with in the ghats. In these instances the numerous strata, instead of being arranged in steps, form a continuous wall. At the Ahopeh pass, at the source of the Goreh river, the wall or scarp is fully one thousand and five hundred feet high ;* indeed, on the north-west face of the hill fort of Hurreechundurghur, the escarpment can scarcely be less than double that height. On the other hand, the steps are sometimes effaced, and a hill has a rapid slope. This originates in a succession of beds of the softer amygdaloids, without any basaltic interstratification ; their superior angles disintegrate, and a slope results. But most usually three or four beds of amygdaloid are found between two strata of compact basalt ; the former disintegrates, leaving a slope, which is not unfrequently covered with forest trees, forming a picturesque belt : the basaltic scarp remains entire, or it may be partially buried by the debris

* Plate 9, fig 1.

from the amygdaloids above; but its great thickness usually preserves it from obliteration, and it rises from the wood below with majestic effect, its black front being finely contrasted with the rich and lively green of its sylvan associate. It is these strata, arranged in slopes and scarps repeated three or four times, and so commonly met with in insulated and other mountains in Dukhun, that constitute the amazing strength of the hill forts of the country, leaving a succession of natural walls encircling a mountain. This feature did not escape the observation of Captain Dangerfield in Malwa, who says, "From the great dif-"ference in the resistance made to decomposition by these trap and "amygdaloid beds, their exposed ends acquire a very distinct degree "of inclination and character; the amygdaloid forming a great slope, "and affording a loose mould covered with vegetation, the trap retain-"ing its original perpendicularity and dark bareness."*

In the alternation of the strata there does not appear to be any uniformity; but the general level, thickness, and extent of a stratum are preserved, as in sedimentary rocks, on both sides of a valley; the basalt and hardest amygdaloids being traceable for miles in the parallel spurs or ranges; but the imbedded minerals, and even the texture, vary in very short distances.

Columnar Basalt.—A great geological feature of Dukhun is the occurrence of columnar basalt. The basalts and hardest amygdaloids run so much into each other that the line of separation is not always readily distinguishable, excepting of course the lines of horizontal stratification. I observed the prismatic disposition more marked and perfect in the basalt strata than in the amygdaloids, and the more or less perfect development of determinate forms was dependent on the compactness and limited constituents of the rocks. Basalts and amygdaloids, however compact, with many imbedded matters, rarely formed columns. Perfect columns were generally small, of four, five, or six sides; but the prismatic structure sometimes manifested itself in basaltic and amygdaloidal columns many feet in diameter. A bare mention of the places where they occur will testify to their extended localities.

On the low table-land of Kurdah, near Serroor, between sixty and seventy miles east from the ghats, columnar basalt occupies an area of many square miles. Small columns are seen in most of the slopes of the very narrow sinuous valleys of the flanks of the platform, and

* Malcolm's Central India, Appendix, p. 322.

frequently the tops or terminal planes of columns are observed on the table-land forming a pavement. The perfect columns in the flanks are generally small, four, five, or six-sided, and rest on a stratum of basalt or amygdaloid. In some spots the columns are articulated, in others not. In a mass of columns in the face of the table-land towards Serroor the columns are of different lengths, but spring from the same level. More articulations having been washed from the outer columns than from the inner by monsoon torrents dashing over them, a pretty flight of steps remains. The columns of this table-land are from the most part erect, but sometimes stand at various angles, to the horizon, usually at 45°. In one instance, near the village of Kurdah, they lean from the east and west, towards a central upright mass: these are about fourteen feet in length, and are not articulated. In a mass of columns facing the west, and two miles south of the cavalry lines at Serroor, some are bent and not articulated; they are nevertheless associated with straight columns, which are articulated. At Karkullah thirty miles north-west of Poona, between Tellegaon and Loghur, a hill has been scarped for the great military road. Very numerous small columns occur in the escarpment, and they lie piled upon each other in a horizontal position; the only instance of the kind within my knowledge in Dukhun. Two or three hundred yards west of the village of Yewtee Purgunnah Kurdeh, in the rocky banks of a rivulet, imperfect columns are seen. On the right bank they are so marked, as to have excited the attention of the natives (an unusual event); and they are daubed with red lead, in the manner of Hindoo deities, and venerated.

At Kothool, twenty-two miles south of Ahmednuggur, there is a thick stratum of close-grained gray homogeneous basalt in the face of the hill on which is seated the temple of Kundobah. Vertical and horizontal fissures are seen in the lateral plane or exposed edge of this stratum, but they are so far from each other as to leave huge blocks between them, giving the appearance of the superstratum of the hill being supported by massive articulated pilasters. Parts of the exposed edge are detached from its mass, leaving rude columns four or five feet in diameter, eight or ten high, and composed of three or four weighty stones disposed to assume geometrical forms. In the water-courses near Kurroos Turruf Ranjungaon, columns are observable. The basalt is bluish gray, compact, has a vitreous hue, and sharp fracture. The columns occur very abundantly in the slope of the hills, on either side of a very narrow valley running westward from the village of Ankoolner, Ahmednuggur collectorate. They are five

or six-sided, articulated, and from a foot to two feet and a half in diameter, and of various lengths; the lateral planes perfect, but in some instances the sharpness of the angles has been affected by weathering. The texture is close-grained, colour almost black, and they affect the needle.

At Jehoor, near the source of the Seena river, in an insulated hill, an obscure columnar disposition is met with in a rock, in which in other places I had not seen the slightest trace of it. A stratum of red, cellular, amygdaloid fifteen feet thick, has subcolumns in its exposed edges eight or ten feet in diameter. In the banks of a water-course running into the Hunga river, half a mile east of Parneir, on the elevated table-land between the cities of Ahmednuggur and Joonur, basaltic columns are very numerous, they are five or six feet high, not articulated, and are not quite perpendicular. This formation is evidently extensive, as the ends of columns, chiefly pentangular, appear in the bed of the water-course for some distance, forming a pavement of geometrical slabs. The ends of columns of different lengths also appear in the southern bank at intervals, forming flights of steps. The basalt of which these columns are composed is very close-grained, almost black, with shining specks of a metallic lustre. The rocky banks of the Kokree river at Jambut, in the plain of Joonur, exhibit a strong inclination to a large columnar structure. In the hill fort of Singhur, at an elevation of 4162 feet, at the western end of the fort, there is a sheet of rock which has the appearance of a pavement of pentangular slabs. The slabs are no doubt the terminal planes of basaltic columns. The same is observed in the hill fort of Hurreechundurghur, about seventy miles north of Singhur; also in the bed of a water-course one mile north-east of Barlonee, near the fortress of Purrunda, 112 miles east-south-east of Singhur; and, lastly, in the bed of the Mool river at Gorgaon, Poona collectorate. These pavements extend to Malwa, as Captain Dangerfield mentions their occurrence in the beds of the Chumbul and Nerbuddah (Nermada) rivers.* The other localities of basaltic columns, or a marked disposition to this structure, were in a well at Kumlepoor, between the fortress of Purrunda and Barlonee, near the left bank of the Seena river; at Kheir Turruf Rasseen, in the face of a headland, abutting on the Beema river, on which the town stands; in the ascent to the temple of Boleshwur Turruf Sandus, Poona collectorate; and, finally,

* Malcolm's Central India, Appendix, pp. 329, 330.

in the scarps of a mountain running down into the Konkun, and seen from the Naneh ghat, about three miles distant. Here the Giant's Causeway in Ireland is brought to mind; but the scale of the mountain is infinitely more magnificent, being fully 4000 feet high. There is a double row of columns, but from their inaccessible situation, I could only examine them through my telescope, and cannot testify, therefore, to their perfect development.

Captain Dangerfield only once speaks of columns. They lie about a mile from the Nerbudda(Nermada), between Mundleysir and Mhysir, at 696 feet above the sea: they are either vertical or highly inclined. General Hardwick has published a lithographic sketch of them.* I have already stated that Dr. Voysey found columnar basalt in many places in the Gawelghur range.

Schistose structure.—Following the preceding formation, I may mention, that in some few places a schistose structure was met with; but its extent was limited to a few yards, the lamellæ were vertical, from an inch to three inches in thickness, being perfect tables, with parallel bounding planes. The rock in which this structure occurs, is a simple, indurated, gray clay, which flies into fragments under slight blows from the hammer. At Dytneh near Serroor some very perfect specimens have led the inhabitants to connect mystic influences with so artificial a development of inorganic matter. The spot is daubed with oil and red lead, and venerated.

Basalt en boules.—Another characteristic feature is the general diffusion of those rounded or oval masses of compact basalt, with concentric layers like the coats of an union, which the French geologists denominate "Basalt en boules," and ourselves, nodular basalt.

These concretions are usually found at the base of hills, buried in the debris from the decomposing strata; but in the Konkun, between Choke and Campolee (the latter at the foot of the Bore ghat), two villages on the high road between Bombay and Poona, I met with them lying on the surface over a considerable area. They occur in a similar manner on the table-land of the ball-practice hill at Poona. At Koothool (already mentioned), in the slope of the hill, and in the debris at its base, and along the edge of the table-land near Paubul, they are abundant; but the finest specimens are seen near the village of Karkullah, thirty miles north-west of Poona, associated with hori-

* Malcolm's Central India, Appendix, p. 323.

zontal basaltic columns. The hill has been cut away, to form the great military road. In making the escarpment, the balls were met with, and it being impossible to cut through the nuclei in vertical sections, it was either necessary to leave them projecting or to remove them altogether: in the latter case cavities remained equal to the hemispheres of the nuclei; and the vertical sections display from ten to fifteen concentric layers of friable gray stone, which in some instances I have found to affect the needle. I compared specimens of the nuclei with a mass brought by me from the Solfatara at Naples, and found them quite similar in aspect, colour, hardness, and great weight. This formation excited the attention of those gentlemen who have visited the northern and eastern parts of the great trap region;* but Dr. Voysey was quite mistaken in supposing it formed the basis of the western ghats. Captain Coulthard speaks of it in Sagar†. Major Franklin also noticed it in the trap of Sagar, in lat. 23° 51′, and long. 78° 44′, at 1933 feet above the sea, as " frequently globular; the nuclei " of the decaying masses, varying in size from an egg to a large bomb- " shell, and their decomposing concentric lamellæ being generally " very thin, and often very numerous."‡

Dykes.—I now pass to the basaltic dykes, several of which came to my notice in different parts of the country. They are all vertical, and I did not observe that they occasioned any disturbance or dislocation in the strata of basalt and amygdaloid, through which they passed.

Two dykes run obliquely across the valley of Karleh (thirty-five miles north-west of Poona), and intersect each other: they are about four feet thick and cut amygdaloidal strata. A prismatic disposition is

* Dr. Voysey says, " The nodular wacken or basalt is one of the most common forms " of trap in the extensive districts composed of the rocks of the family south of the " Nermada (Nerbuddah) river. It occurs perpetually in the extensive and lofty range of " mountains (the Gawalghur), situated between the Purna and Tapti rivers, and appears " to form their principal mass. It is found equally abundant throughout the whole of " Berar, part of the provinces of Hyderabad, Beder, and Sholapoor, and appears to form " the basis of the great western range of trap hills which separate the Konkun from the " interior of the Dukhun."—*Physical Class, Asiatic Researches*, pp. 126, 189.

† " The base of the hills is invariably broader than the summit; and if the sides of a " hill are smooth and even, *balled* trap, often a concentric lamellar variety will be the " principal component matter, decomposing and decomposed into a predominating work- " able clay, still showing the parallel converging layers."—*Physical Class, Asiatic Researches*, p. 78.

‡ Physical Class, Asiatic Researches, p. 30.

generally observable in the fracture, and from one of them I obtained a square prism, which lay at right angles to the walls of the dyke. The texture is compact. The military road running through this valley and down the Bore ghat to Panwell, is frequently crossed by ridges which I presume to be the outcrops of dykes. A dyke is seen on the southern slope of an insulated hill, near the villages of Bosree and Digghee, seven and a half miles north of Poona*. It is about four feet thick, has a transverse prismatic fracture, is compact, and runs from the bottom to the top of the hill ; but it is not discoverable in the northern slope. It is visible from the cantonments at Poona. A similar dyke occurs in the hill at Ombreh, twenty miles north-north-west of Poona. But the most remarkable dyke runs vertically, from east to west, through the hill fort of Hurreechundurghur. It is first seen, of a thickness of six or seven feet, in the ascent of the mountain on the south-east from Keereshwur, about four-hundred feet below the crest of the scarp. The path of ascent into the fort is intersected by it, and its prismatic fracture, at right angles to its planes, offers a few available steps in the ascent. It is traceable for about three-hundred feet in perpendicular height. On the top of a mountain, within the fort, about a mile to the westward, it is discoverable at intervals, cutting through basaltic and amygdaloidal strata. I could not ascertain whether or not it appears in the western scarp of the mountain, the point to which it directs its course being wholly inaccessible.

The gentlemen whose geological memoirs I have quoted, rarely advert to the subject of trap dykes, and their notices are very brief. Capt. Dangerfield says, " The trap of the southern boundary of Malwa " is much intersected by vertical veins of quartz, or narrow seams of a " more compact heavy basalt, which appears to radiate from cen- " tres."† Beyond the continuous trap region of the peninsula, Dr. Voysey notices a basaltic vein in sienite, near the Cavary river at Seringapatam, which must have been propelled upwards, as it broke through an oblique seam of hornblende in the sienite, and carried the pieces up above the level of the hornblende vein‡. " On the eastern coast," Mr. Calder says, " from Condapilli northward, the granite is " often penetrated and apparently heaved up by injected veins or " masses of trap, and dykes of greenstone."§

* See Plate xxxiii. fig. 1. † Malcolm's Central India, Appendix, p. 330.

‡ Physical Class, Asiatic Researches, part1. p. 22. § Ibid, part 1. p. 10.

Ferruginous Clay.—The next distinctive feature is the occurrence of strata of red ochreous rock, in fact, MacCulloch's ferruginous clay underlying thick strata of basalt or amygdaloid, precisely as is seen to be the case in the Giant's Causeway in Ireland. It passes through every variety of texture, from pulverulent, friable, and indurated, to compact earthy jasper. The stratum is from an inch in thickness to many feet. The rock makes a red streak on paper, with the exception of the very indurated kinds, and does not affect the needle. It is pulverulent near the basaltic columns at Serroor, friable under sub-columnar red amygdaloid, near the source of the Seena river, indurated under basalt at Kothool. Although hard, it is here so cellular as to have the appearance of sponge, and reduced to powder, looks like brickdust.

In the scarps of the hill fort of Hurreechundurghur and a mountain near Joonur in which are excavated numerous Boodh cave temples, it is found compact and homogeneous, and is, in fact, an earthy jasper. In these localities it lies under from three-hundred to six-hundred feet of basalt. In the former locality it is about three feet thick, in the latter one foot. At Nandoor, north-north-west of Ahmednuggur, in the valley of the Godavery river, it is found as a porphyritic stratum, many feet in thickness, and is used as a building stone. The imbedded matter consists of very minute crytsals of lime. At Wangee, lying nearly in the latitude of Barlonee, but differing 18 miles in longitude, and at Barlonee it occurs as an earth : as both places lie on the same level, I have no doubt the stratum is continuous between them. It occurs abundantly in the ghats, frequently discolouring the rivulets, and giving a ferruginous character to the soil over a considerable area. When thin, andunder heavy beds of basalt or amygdaloid, the exposed edge of the stratum projects, is rounded, and double the thickness of the stratum itself; as if it had once been in a tenacious fluid state, and squeezed out by the superincumbent basalt; such is the case at Jehoor.

Pulverulent Limestone.—Limestone is met with, in the Dukhun, only in three states : pulverulent, nodular, and crystalline. The first occurs in thin seams on the banks of rivers and water-courses and at the base of hills in debris. The seams are from an inch to three feet in thickness, covered by a few feet of black earth. Sometimes in whiteness it resembles pounded chalk, and is then used by children to smear their writing boards.

In this state it occurs at Jehoor and Islampoor near Ahmednuggur.

At Kurkumb and at Salseh ten miles south of the fortress of Kurmaleh, it is met with under black earth in unusually thick strata, and of a peculiar whiteness. Major Franklin notices " a stratum of earthy limestone, white as chalk, at Sagar, occurring under a stratum of amorphous trap."*

Nodular Limestone.—The nodular limestone, which is the well-known kunkur† of India (*kunkur* being a native word for nodule), occurs, like the preceding, disseminated or diffused in the soil, and also on the surface. I have never seen the nodules of a regular crystalline form. They vary in size from a marble to a twelve-pound shot, and many of them are exceedingly irregular in shape, particularly those dug from the banks of rivers. They are sometimes obscurely lenticular. They are so abundant in certain localities that they appear as if showered upon the earth, and disguise its colour. Dr. Buchanan mentions the same in Rajmahl. When upon black soil, they are usually minute and tolerably uniform in size: on other soils their form is variable. In the ghats neither pulverulent nor nodular lime is met with. It is unnecessary to particularize the localities of the nodular kind, as it is of common occurrence eastward from the hilly tracts of the ghats, and is the only source of lime for mortar, a class of persons making a livelihood by collecting the larger nodules. When carefully burnt, they make an excellent cement. Captain Dangerfield describes, " the occurrence (in Malwa) in some parts, particularly near the bottom of the small hills, and banks of the rivulets, of a thin bed of loose marl or coarse earthy limestone."‡

Captain Coulthard says, " In Sagar a white patch of this limestone " mouldering by the weather is the source from whence comes the " particles of kunkur, mixed with the black basaltic earth of the neigh- " bouring valley in such proportion as to add increased fertility to it; " and if a rivulet meanders through that valley (and such is generally " the fact) patches made up of aggregated particles of the same, will " here and there be found; and this it is which the native families pick " out and work into lime."§ Captain Coulthard refers the origin of the nodules to limestone rock underlying basaltic strata, but I cannot trace them to such a source, not having seen strata of compact lime-

* Physical Class, Asiatic Researches, part I, p. 30.

† The Mahratta word is not spelt with an " a." ‡ Malcolm's Central India, p. 328.

§ " Trap of the Sagar District," Physical Class, Asiatic Researches, p. 60.

stone, properly so called, in the Dukhun. The only specimen of compact limestone met with by me was in the bed of the Beema river near Pundurpoor. It was an insulated, amorphous, gray mass, four or five feet in diameter. I looked upon it as an aggregation of the pulverulent particles of the lime disseminated in the neighbouring banks.

Crystalline Limestone.—Lime in a crystalline state occurs only as an imbedded mineral in the amygdaloidal strata, in quartz geodes, and in the nucleus or compact part of masses of mesotype or stilbite. It is rare, compared with the preceding varieties.

Loose Stones.—Another feature of Dukhun is the occurrence of immense quantities of loose basalt stones, as if showered upon the land; also masses of rock heaped and piled into mounds, as if by the labour of man. Their partial distribution is not less remarkable than their abundance. For the most part, the stones have a disposition to a geometrical form, and it is by no means rare to meet with prisms of three or four sides and cubes almost perfect: stones with one or two perfect planes are very common. Their texture is close-grained and the colour verging to black.

At Dehwuree, Hungawaree, Behloondee, Kothool, and Dytneh in the Ahmednuggur collectorate, they are very abundant. At the last place they cover fields several acres in extent, so thickly that the black fertile soil on which they rest is not discoverable: they vary from an ounce to several pounds in weight. Amongst these I picked up a perfect square prism. In neighbouring fields, most unaccountably, there is not a stone to be seen: patches of sheet rock occur in their vicinity. Other localities are the top of the Neem Durra Ghat near Ahmednuggur; the junction of the Beema and Seena rivers below Mundroop; right bank of the Seena at Kurmaleh; between Kurjut and Meerujgaon; and generally it may be stated that the precipitous slopes of the low table-lands of the Desh (open or flat country) are very strong and rocky. For ten miles between Jeetee and Soagaon, Ahmednuggur collectorate, the fields, and even the road, are so thickly strewn with large basalt stones as to render cultivation difficult and travelling penible.

Rocky Heaps.—The singular heaps of rocks and stones above noticed occur at Kanoor, Patus, Kheir, between Kurjut and Meerujgaon, and at other places in the Desh, but not in the Mawals, or hilly tracts

of the ghats. The heaps are from twenty to seventy feet in diameter, and the same in height: when composed of rocky masses without small stones, blocks of three or four feet in diameter and with a disposition to determinate forms, are piled upon each other, constituting rude pillars. In certain parts of the country from fifty to sixty of these heaps are seen within the area of a couple of square miles, and it excites surprise that the intermediate ground is destitute of stones.

Sheets of Rock.—Mention must not be omitted of the constant recurrence of sheets of rock of considerable extent at the surface and totally destitute of soil: this is particularly the case in the Mawals, or hilly tracts along the ghats. They abound with narrow vertical veins of quartz and chalcedony. When of sufficient thickness, the vein splits in the centre parallel to the surface of its walls, the interior being drusy with quartz crystals: the walls consist of layers of chalcedony, cachalong, hornstone, and semi-opal. These veins supply the majority of the siliceous minerals so abundantly strewed over Dukhun.

The localities where the sheets of rocks particularly struck me were Lakungaon, on the plain of Joonur, and generally in the valley of the Goreh river; at Kothool, Pergunneh Kurdeh; at Kheir and Raseen; in the hill fort of Hurreechundurghur; most markedly between Kooldurrun and Pairgaon on the Beema river. At Aklapoor, on the Mool river, they were very extensive; and at Angur, Mohol, Kurjut, and Patkool. Generally in the eastern and south-eastern parts of my tract, much decomposing amygdaloid is found at the surface of the low table-lands or terraces, which, in favourable monsoons, is equal to the support of Jowaree*; but a small deficiency in the rains occasions the destruction of the crop.

Structure and Mineral Composition of the Trap Rocks.—The structure and mineral composition of the trap rocks in Dukhun vary exceedingly in short distances, even in the same stratum; nevertheless, the predominant character does not disappear, although the basalt in a continuous bed may pass several times from close-grained, compact, and almost black, to gray, amygdaloidal, and external decomposing. The same observation applies to the amygdaloids. A variety of compact basalt, of an intense green colour, is susceptible of a brilliant polish, and rivals the celebrated Egyptian kind. It is of great weight and remarkable hardness: the natives use it to work into idols for their

* *Andropogon Sorghum.*

temples, pedestals to the wooden columns in their mansions, and slabs for inscriptions. The bulls of the size of life, always placed before temples of Mahadeo, are cut out of this variety at Raseen, Wurwund, and the renowned Boleshwur. Some of the pedestals in the gateway of the Mankeswur palace at Teimboornee look like mirrors. In the temple at Pooluj, south of Punderpoor, there is a slab six or seven feet long and two and a half broad, covered with an inscription in the Kanree language; and in Punderpoor the streets are paved apparently with the same basalt. At Jehoor and near Ahmednuggur is found a compact kind like the last, but not so heavy. It has a crystalline character and sharp fracture, and has angular siliceous pebbles imbedded: an occasional pebble is loose in its cell. In the Happy Valley near Ahmednuggur the basalt is compact and smooth, with reddish flat transparent crystals imbedded. It opposes a feeble resistance to the hammer, and flies into fragments, some of which have right angles. The basalt, even of the true columns, is not of a uniform texture in different localities: at times it is blackish or gray, and very small, granular or compact; at others, earthy and ferruginous, particularly externally. The basis of the amygdaloids is clay, with more or less hornblende disseminated: they embrace the cellular, porphyritic, hard, friable, and decomposing. I endeavoured to class them agreeably to the prevalence of quartz, chalcedony, lime, mesotype, or stilbite, as imbedded minerals, but found the method of very limited application. Sometimes one mineral only is imbedded, occasionally two, and often the whole.

In Hurreechundurghur quartz amygdaloid prevails: at Aklapoor on the Mool river it is characterized by mesotype, that mineral being imbedded in large masses, and the radii (six or seven inches) are the longest I have seen. At Nandoor it is porphyritic with minute crystalline specks of lime: near Ahmednuggur is seen a cellular, indeed spongiform kind, which is hard, and the cells are empty. A small cellular and pisiform variety is found in the wonderful cave temples of Ellora, and some of the sculptured figures appear as if marked by the smallpox. This observation is partially applicable to the Boodh and Hindoo cave temples of Elephanta, Salsette, Karleh, Joonur, the Naneh ghat, and the Adjunteh ghat; all of which are excavated in basaltic or amygdaloidal strata. The Stilbite or Heulandite amygdaloid is of very common occurrence; but the most prevalent kind is that in which all the minerals noticed above are associated. The stone usually selected for building is of various shades of gray or bluish gray; has hornblende disseminated in very small crystals;

works much easier than some of the compacter basalts, but takes a good polish. The entire temples of Koorul and Boleshwur, with their innumerable alto-relievo figures and laboured ornaments, are built of this variety of trap, which is, in fact, a greenstone, although less crystalline than the European rock. There is a variety selected carelessly, also used in building, which has the structure and nearly the external characters of the last, but which, in weathering, exfoliates, and the buildings fall to ruin; such is the case with the great temple in Hurreechundurghur.

I must not omit mention of two remarkable rocks which, as far as my reading extends, have not been noticed by authors on European geology. The first is an amygdaloid in which compact stilbite is imbedded in a vermicular form. One of its localities is the insulated hill on which stands the temple of Parwuttee in the city of Poona*; and it is met with in many other places. Captain Dangerfield observed the same peculiar stratum near Sagar. He says, "There occurs an "amygdaloidal or prophyritic rock consisting of a compact basis of "wacké, in which are imbedded in great abundance small globular "or uniform masses, but more usually long *curved* cylindrical or "vermiform crystals of zeolite."†

The other rock occurs as a thick stratum of amygdaloid at the elevation of four thousand feet, in the hill forts of Hurreechundurghur and Poorundhur; and in the bed of the Goreh river at one thousand and eight hundred feet, near Serroor. The matrix resembles that of the other amygdaloids, but the mineral imbedded is a glassy felspar in tables resembling Cleavelandite, crossing each other at various angles, and so abundant as to occupy a moiety of the mass. I have only remarked it in the above localities, and it does not appear to have come under the notice of the gentlemen I have so often quoted in other parts of the peninsula.

Minerals.—Minerals are not uniformly dispersed in Dukhun. In one part quartz predominates, in another chalcedony; and these are more or less associated with jaspers, agates, hornstones, heliotrope, and semi-opal or cachalong. In other places particular members of the zeolite family prevail, nearly to the exclusion of the siliceous class; and elsewhere there is a diminution of minerals amounting almost to privation. Amethyst quartz is rare in Dukhun; when met with it constitutes the crystal, lining the interior of geodes of agate. I have

* See Plate 9, fig. 2. near to the city of Poona. † Central India, p. 328.

not seen it in veins. Pseudomorphous quartz is common; the most frequent impression is that of rhomb spar. Lime occurs only in three crystalline forms: rhomb, dog-tooth, and the dodecahedron. The first is found on the surface, and imbedded in masses of quartz and compact mesotype; the two latter forms are associated with ichthyophthalmite in cavities in the amygdaloid strata*.

The following are a few of the mineral localities:—At Kothool, south of Ahmednuggur, the numerous quartz and chalcedony veins cover the country with agates, colourless quartz-crystals, and chalcedony; some of the specimens are fully a foot thick, including both walls of the vein. Here are met with some few crystals of calcarious spar inclosed in quartz. At Ahmednuggur, to the above siliceous minerals, some members of the zeolite family are to be added, principally stilbite. At Nandoor, on the plain of the Godavery river, the zeolites disappear, and the siliceous minerals are limited in number. On the contrary, at Jamgaon, eighteen miles west of Ahmednuggur, on the upper terrace or plateau, in addition to all the minerals enumerated, bits of yellow and red jasper and heliotrope occur. Asscending the Mool river from Nandoor, at Aklapoor, great masses of mesotype, with radii several inches long, are found imbedded in friable amygdaloid. North of Aklapoor, at Gorgaon, a new mineral occurs in a mass two feet in diameter. Its depth I do not know, as it lay partly buried in the amygdaloid bed of the river: its colour green, and breaking into rhombs. Gorgaon is the only locality known to me of this mineral. Its measurements are those of calcarious spar, but the specific gravity is less. It is stated to be coloured by green earth. It is interesting from being unknown in the cabinets in England.

A few miles further up the Mool river, at the village of Chas, in the shoulder of a hill formed of numerous thin horizontal beds of decomposing amygdaloid, many specimens of cloudy calcarious spar, imbedded in stilbite, are found, and the siliceous minerals are rare. Ascending to the source of the river the same scarcity prevails. Three miles south-south-west of Chas, at Brahmunwareh, great masses of stilbite, of the radiating foliate kind, are imbedded in hard amygdaloid. In the hill fort of Hurreechundurghur, although siliceous minerals are not abundant, crystallized quartz of various colours is seen, a feature not characterizing the Desh or open country. South of Ahmednuggur, as far as Soagaon on the Beema river, and Meerujgaon on the Seena river,

* That comparatively rare European mineral, ichthyophthalmite, is most abundant and of great beauty in the neighbourhood of Poona.

the Ahmednuggur minerals prevail; hence descending the Beema to its junction with the Seena, a gradual diminution takes place, and at the junction they almost disappear; returning north, at Ashtee, between Kurkumb, and Mohol, a few are met with. At Oondurgaon, and up both banks of the Seena river to Purrunda, numerous and very fine specimens of milk opal, with a flame-coloured tinge in transmitted light, are found on the surface; and this is the only locality where I met with opal as a distinct mineral; and here the members of the zeolite family are very rare. At Tudwull, between Oondurgaon and Barlonee occur the only specimens of black calcarious spar seen by me in Dukhun; it is associated with transparent calcarious spar. In excavating wells in the cantonments at Poona, splendid specimens of ichthyophthalmite were brought to light; and generally in the bed of the river Mota-Mola and the neighbourhood, fine specimens of heliotrope and coloured quartz occur. The other minerals are *nadelstein, analcime, chabasite,* and *laumonite.* Captain Dangerfield's details prove that the minerals of Malwa are identical with those of Dukhun.

Natural Salts.—Only two kinds of natural salt came under my notice, namely, muriate and carbonate of soda.

With respect to the former, many of the wells at Ahmednuggur are brackish; and there is a rivulet running into the Seena river about two miles north-west of the city, which has its source a few miles distant, called the Salt Brook. It passes over a saliferous soil; and in its dry bed, or on insulated stones standing in its stream, are incrustations of common salt intimately mixed with carbonate of lime. No use is made of this salt. The saline impregnation of the soil extends to some distance west and north-west of Ahmednuggur, as I found a handsome well at Kurjooneh, eight miles distant, filled with water so brackish as not to be available for domestic use. At Wurgaon, between Kurjut and Pairgaon, a peculiar hoary appearance of a patch of ground in the midst of withered grass, led me to examine it. The whiteness was occasioned by lime in minute particles, mixed with a little muriate of soda.

The third locality of common salt was in the bed of a rivulet at Koond Mawlee, near the falls on the Kookree river, between Serroor and Kowta. A little common salt, with a trace of carbonate of soda, appeared, incrusting the rocky bed for a few feet near the water line. I did not observe common salt elsewhere. My attention was first directed to carbonate of soda at Serroor, by observing washermen

digging for earth in the banks of a rivulet; learning that they used it to wash their clothes, I obtained a quantity; lixiviated the earth, boiled down the lixivium, and on cooling obtained a large crop of crystals, which the usual tests indicated to be carbonate of soda. I only met with one other bed, although I have no doubt they are numerous. At Kalbar Lonee, twelve miles east of Poona and two miles south of the Mota-Mola river, within an area of 200 yards, a constant moisture and partial absence of vegetation is observed. An efflorescent matter appears on the surface every morning, which is carefully swept up and sold to washermen: it is carbonate of soda. The occurrence of salts in the trap formation did not escape Captain Dangerfield's notice. He states that "the banks of the Nerbuddah (Nermada) near Mundleysir, consist of an upper thin bed of vegetable mould; a central bed, chiefly of indurated marle, strongly impregnated with muriate of soda; and a lower bed, of a reddish hue, with much carbonate of soda. In the dry season these salts form a thick efflorescence on the surface of the bank."* Saltpetre is manufactured in Dukhun, not from nitrated soils, but from the scrapings of old walls. I have also seen specimens of muriate of ammonia obtained by the brick and tile makers in burning dung, stable and other refuse matters in their kilns.

Ores.—No other ore than that of iron is found in Dukhun. It is only worked, to my knowledge, at Mahabuleshwur, at the source of the Krishna river. It occurs as a nodular hematite, associated, I understand (for I have not been at the spot myself), with laterite.† This ore produces the celebrated Wootz steel.

* Malcolm's Central India, p. 324.

† This association of nodular *hæmatite* with *laterite* is sufficiently intelligible, when we recollect the manner in which the latter rock is very frequently formed, according to the undoubted testimony of Dr. Benza (see Madras Journal, No. 13, p. 255), viz. from the decomposition of the former. The distinguished geologist whom we have named, with true philosophical caution, forbore from giving the name of laterite to the decayed hæmatite of the Neilgherries and Northern Circars, because observation has not yet determined fully whether that peculiar mineral product "is a rock *per se*, or only the result of a modification in the structure of the metallic ore"; or, as at the Red Hills near Madras, a conglomerate (Madras Journal No. 12, p. 110): he, therefore, termed the decayed hæmatite *lateritic iron ore*. That a very great proportion of the so-called laterite owes its origin to these two sources there is no doubt; and, to use the language of Dr. Benza, "it is a common mistake to apply the name to decomposed rocks of the primitive class, and to any other that have a red, ochreous colour, and softish consistence." Evidence appears to be still wanting to prove that it ever is found as a distinct formation; all the facts recently observed go to show that it is nothing but decomposed hæmatite, or other rock; or that it is a conglomerate.—EDITOR *Madras Journal.*

Organic Remains.—I did not meet with organic remains of any kind whatever. Captain Coulthard* in Sagar, Major Franklin in Bundelkand, and Captain Dangerfield in Malwa, were equally unsuccessful. Dr. Voysey, indeed, mentions a bed of freshwater shells in a stratum of indurated clay near the Tapty river in the Gawelghur hills ; also at Medconta, two-thousand feet above the sea, on trap† ; but these may have been recent, as he does not say to the contrary.‡ Mr. Calder, in his general observations on the geology of India, § says, " But hitherto the most striking phœnomenon in Indian geology is the almost total absence of organic remains in the stratified rocks and in the diluvial soil." As this must have been written with a knowledge of Dr. Voysey's paper, it being in the same volume with his own, it is probable he considers the shells recent.||

Thermal Springs.—Thermal springs do not exist in Dukhun within my limits ; but there are three distant localities in the Konkun below the ghats, where hot water gushes up from numerous crevices in trap rocks over an extensive surface.

The first is at Vizrabhaee, forty-eight miles north of Bombay, where the principal springs are in the bed of a river, and in the monsoon are consequently lost in the swollen stream ; but in traversing the jungle in the vicinity I have met with detached pools of hot water, which are unaffected by the rains ; their temperature is very high. The second

* Physical Class, Asiatic Researches, p. 81.

† Mr. Malcolmson discovered extensive deposits of fossil shells and seeds of *charæ*, resting on granite and basalt, in the Sichel hills to the north of the Godavery river in the territory of Hyderabad (See Madras Journal, No. 12, p. 203). That gentleman's specimens collected in this locality, were sent home a considerable time ago, for examination by Mr. Lyell, from whom some account of them may shortly, it is hoped, be expected. Mr. Malcolmson's *Notes on the Geology of the country between Hyderabad and Nagpur*, may be studied in conjunction with Col. Sykes' Memoir, as they treat of tracts between the same parallels of latitude, the former commencing with the meridian of longitude where the latter leaves off.—Editor *Madras Journal.*

‡ Physical Class, Asiatic Researches, p. 194. § Ibid., p. 16.

|| It is necessary to observe that Colonel Sykes' Memoir, though published in the last volume of the Transactions of the Geological Society, was presented to that association so long ago as 23d January 1833. At the time it was written, therefore, the author was not aware of the extensive deposits of organic remains since discovered in several places in northern India. Thus, owing to the rare appearance of the bulky and costly volumes of this admirable Society, the communications when given to the world have lost their freshness and novelty, and, as in this instance, are behind hand in knowledge of recent discoveries. If the publication of its transactions is to be extensively useful for the advancement of geological science, the Society must descend from the dignity of a *quarto*, to the utilitarian system of *octavo* journals.—Editor *Madras Journal.*

locality is that mentioned by the late Dr. White, of the Bombay army. The hot wells are called Devakl Unei, and are fifty miles south-east from Surat,* at the foot of some hills ; the temperature in the different springs ranges from 111° to 120° Fahr. They are spoken of as being in the vicinity of Anaval and Veval, but as these places agreeably to the map of India, are only thirty miles from Surat, there is evidently some mistake with regard to the distance. The third locality is at Mahr, on the Bancoot or Fort Victoria river, about seventy-five miles south of Bombay. I know of these springs only from report. The whole of the above springs, extending through 3° of latitude, lie nearly in the same parallel of longitude (73°), and are within twenty-five miles of the sea.

In a manuscript report to the government of Bombay, on the province of Khandeish, Colonel Briggs has the following passage testifying to the occurrence of thermal springs above the ghats :—

"Among the natural curiosities of Khandeish are the hot springs of the Satpoora hills, particularly those of Soonup Deo and Oonup Deo, the former in the district of Arrawud, and the latter in the deserted Pergunneh of Amba. The former is so hot that the hand cannot be borne in it ; the latter is less ardent, and is used as a hot bath ; they are both said to possess medicinal qualities, and are considered useful in the cure of cutaneous disorders,—amongst others leprosy."

Dr. Buchanan speaks of hot springs at Rishikunda and Bhimband in the trap mountains of Rajmahl ;† and the Rev. Mr. Everest mentions a thermal spring associated with a trap bed at Katcamsan, between the 23d and 24th parallels of latitude, and longitude 86° and 87°‡. Dr. Adam mentions that of Sitakhund near Monghyr on the Ganges,§ Dr. Davy speaks of one at Cannina, ||Ceylon ; and I am informed they are to be met with in Canara. Mr. Crow, formerly commercial agent of the Bombay government in Sinde, in his manuscript reports, mentions a thermal spring near Corachee on the Indus, of which the water is almost boiling hot. In Major Cruickshank's manuscript revenue map of part of Goojrat a hot spring is placed at Tooee, near Ruttenpoor on the Mhye river, in latitude north 22° 49′ and longitude east 73° 30′ ; and there is another at Lawsoondra, eighteen miles west-north-west of Tooee. These instances, which I am satisfied could be multiplied by diligent inquiry, afford ample proof of the wide occurrence in

* Transactions of the Royal Asiatic Society, 1833. † Gleanings of Science, vol. I. p. 36.

‡ Gleanings of Science, May 1831, p. 135. § Geol. Trans., 1st Series, vol. v. p. 349.

|| Geol. Trans., 1st Series, vol. v. p. 313.

the peninsula of India of those singular phœnomena, the satisfactory explanation of the causes of which is still a desideratum in geology.*

Craters.—Volcanic products were not seen by me, nor any conformation of the hills that might be deemed an extinct crater; although the porcelain and ferruginous clays, and the exterior coat of the various quartz and jasper minerals indicate their having been exposed to igneous action. Captain Dangerfield did not meet with volcanic matters or craters in Malwa or the Vindhya range, but states a tradition exists of the celebrated city of Oogein, and eighty other places having been destroyed at a remote period by a shower of earth; and the people say that in the Vindhya range and Rajpeeply hills there are hollows near their summits "sometimes filled with water, which may be craters."† As the old city of Oogein stood upon a river constantly overflowing its banks, it was probably buried in alluvium. Mr. W. Hunter attributed its destruction to one of three causes,—earthquake, overflowing of the Seeprah, or drift earth by high winds; and, although the least probable of the three, inclines to drift earth. He states there are not any traces of volcanic agency in the buried city, nor in the neighbourhood.‡ The remains of the city of Mhysir, on the banks of the Nerbuddeh (Nermada), are found in alluvium. We may safely say, therefore, there are not any indications of volcanic action of a comparatively recent date.§

* See Mr. Malcolmson's account of the thermal springs of Kair, in No. 12 of this Journal, p. 212.—Editor *Madras Journal.*

† Malcolm's Central India, Appendix, p. 325. ‡ Asiatic Researches, vol. vi. p. 39.

§ The great lake of Lonar seems to possess the characters of a volcanic crater, according to the following account by Mr. Malcolmson:

"The Lonar lake is forty miles from Jaulnah. It is a vast crater nearly 500 feet deep, and four or five miles round on the upper margin. Its waters are green and bitter, supersaturated with alkaline carbonate, and containing *silex* in solution as well as some iron. The mud is black and abounded with sulphuretted hydrogen, but the water is pure and without smell. The rocks are volcanic, and springs of pure water rise out of the salt mud or stream down the sides of the punch bowl, thus strangely sunk in a nearly level country, there being but a gentle rise to the edge. The crystals of salt found at the bottom by the divers who remove it for purposes of commerce are tabular. Between this and the hot springs of *Kair* others are found, and the direction of the range corresponds with the dykes described by Voysey in the Hyderabad country."—*Journal of Asiatic Society of Bengal*, vol. 3d, p. 302.

A particular account of this very remarkable place, with specimens of the mineral productions of the vicinity, and of the water of the lake and its saline and other contents, would be very acceptable.—Editor *Madras Journal.*

Extent of Trap Region, &c.—I will now offer a few observations on the amazing extent of the trap, laterite, nodular limestone, granite, and gneiss formations in the peninsula, limiting their application to 25° of north latitude. My personal knowledge of the country extends from the sea on the western side, to Arungabad, in 75° 33', and Sholapoor, 75° 53' east longitude; north, nearly to Kandeish, and south, to Beejapoor and the Kristna river. Captain Dangerfield takes up the country on the north, nearly where my knowledge of it terminates, and says, "It (Malwa, including the Vindhya range) appears to constitute the northern termination of a very extensive secondary trap formation, which extends from the extremity of the Dukhun, and probably even Mysore, forming all the country above the ghats, and part of the plains below, on the western side of the peninsula, including the islands of Bombay, Salsette, Elephanta, &c."* He carries the continuous trap north to Neemutch, in latitude 24° 27', at 1476 feet above the sea. Its western limit is at Dohud, longitude 74°. Major Franklin and Captain Coulthard take it up in the eastern limits of Malwa, and trace it through Sagar; and it continues to an unknown extent towards Sohagpoor and the source of the Nerbuddeh river, on the table-land of Amarakantah, in longitude 82° east. Dr. Voysey describes its eastern limits at Nagpoor, latitude 21° 10' N., and longitude 79° 14' E. at 1000 feet above the sea. Mr. Calder states it passes from Nagpoor southward by the confines of Hyderabad, as low as the 15th degree of latitude, and taking a north-west direction terminates on the sea-coast at Bancoot or Fort Victoria, in latitude 18°. But specimens of rock shown to me from the Kolapoor country above the ghats, between the parallels of latitude 16° and 17° N., bear testimony to the trap extending nearly a degree and a half further south along the ghats than Mr. Calder supposed. Indeed its southern limit in the Konkun, Mr. Fraser states to be at Malwan, fifty miles north of Goa.† From the above evidence we have proofs of a continuous trap formation covering an area of from 200,000, to 250,000 square miles, a phœnomenon unexampled in any other country whose geological structure has been examined. It appears to me, however, that the above are not the absolute limits of the trap. Dr. Buchanan‡ and Mr. Jones§ describe the

* Malcolm's Central India, Appendix, p. 320.

† Geological Transactions, 2d Series, part 1. p. 153.

‡ Gleanings of Science, vol. iii. January, 1831, p. 1.

§ Physical Class, Asiatic Researches, p. 165.

Rajmahl hills in latitude 25° and longitude 88° to 89° E. as trap; the latter says the basalt is of amazing thickness. The Rev. Mr. Everest,* in a journey from Calcutta to Ghazipoor, passed four distinct broad beds of trap between the parallels of north latitude 23° and 24°, and longitude 84° and 87°. He states these beds to have an inclination to a common axis, and he thinks it probable they are connected beneath the granite and gneiss. Mr. Royle travelling the same route, observed the same beds. Mr. Everest's diagram shows their longitudinal axis on a line between the Rajmahl hills and the sources of the Nerbuddeh and Soan rivers; and as the trap of the Vindhya range and Sagar extends towards these sources, it is very probable the ramifications are connected with the beds (seen by Mr. Everest) and the Rajmahl hills, forming a belt across India from the 73° to the 89° of longitude, extending, in fact, from near the mouth of the Nerbuddeh river to the Ganges at Rajmahl. The southern limit of trap is much lower than is assigned to it by Mr. Calder,† as Dr. Voysey describes a basaltic dyke at Seringapatam, in latitude 12° 26′; and Mr. Calder himself mentions partial deposits of overlying rocks as far south as Cotallum, at the extremity of the great western range, between the parallels of latitude 8° and 9°. Mr. Babington, passing through Mysore, describes all the black rocks he met with as hornblende passing into basalt. He evidently adverts also to nodular basalt.‡

Age of Trap.—With respect to the age of the great trap formation of India, it would appear from Major Franklin's Memoir on Bundelkund, that its northern extremities rest on sandstone, which he considers identical with the new red sandstone of England; the trap would therefore be posterior to the carboniferous series and belong to the supermedial order. But the Rev. Mr. Everest§ adduces valid reasons for questioning the correctness of Major Franklin's opinion; and it may be inferred, that he is doubtful with respect to the exact equivalent in Europe of the Indian sandstone, as it is much associated with the primitive rocks.‖ In fact, where are the oolitic rocks above, and the

* Gleanings of Science, vol. iii. p. 135.

† The limitation of trap by Mr. Calder of course is only intended by him to be understood as of a *continuous formation*: basaltic dykes, and veins, of every shape and size, being universally found in S. India. (See Dr. Benza's geological papers in Nos. 12, 13 and 14 of this Journal). EDITOR *Madras Journal.*

‡ Geo. Trans. 1st Series, vol. v. p. 325.

§ Gleanings of Science, vol. iii. p. 211. ‖ Gleanings of Science, vol. iii. p. 213.

magnesian below the red sand, where the rock salt and gypsum, and where, above all, the characteristic organic remains of the lias and magnesian limestone? It would be idle, therefore, to speculate on the era of a formation without a standard of comparison to direct the judgment. The question of the manner of the formation of the horizontal beds of trap with their vertical edges is very interesting. It will be said they were ejected under the pressure of an incumbent ocean. If such had been the case, where are the marine remains, and would not there have been sedimentary deposits upon them? Moreover, if viewed as coulées from craters, would not the beds have thinned out, instead of preserving the parallelism of their superior and inferior planes and their vertical edges.

*Laterite.**—Laterite is a ferruginous clay mottled red and yellowish. When first dug from its bed, it is soft, and is easily fashioned into the form of bricks or large square masses for building; and if my recollection serves me right, it constitutes the material of the walls of the fort at Tellicherry and the jail at Calicut. It rapidly indurates on exposure to the atmosphere. It is destitute of fossils as far as is yet known.

That curious and very extensive rock, aptly denominated laterite (I learn from the information of a friend), occurs at the source of the Kristna river in latitude 17° 59′, at an elevation of 4,500 feet above the sea. It covers the low land between the sea and the great western range from the southern Konkun to Cape Comorin, and, agreeably to Dr. Davy, passes into Ceylon. I casually observed it at Tellicherry and Calicut, respectively seven hundred and forty-four and seven hundred and fifty-six miles south of Bombay; and at Calicut granite rises through it. On the low land at the base of the great *eastern* range, Mr. Calder says it re-appears between the 11° and 12° parallels of latitude, and recurs in increasing patches passing northwards, covering granite. The Rev. Mr. Everest speaks of laterite forming a fringe to great part of the bay of Bengal and covering the edge of the granite of either peninsula.†

Nodular Limestone.—In addition to the evidence already adduced of the extensive occurrence of nodular limestone, Dr. Buchanan mentions

* With regard to laterite, see note at foot of page 364 of this article, and the former Numbers of this Journal quoted therein.—Editor *Madras Journal.*

† Gleanings of Science, vol. iii, p. 135.

having met with it in Rajmahl trap hills, in Bengal, and in Mysore. A writer in the 'Gleanings of Science'* states that it occurred in repeated borings for water in Calcutta, at from 50 to 112 feet below the surface. Another writer† says, it is "very extensively distributed throughout Hindoostan," and further asserts that it is a "most distinguished feature of Indian geology." The Rev. Mr. Everest and Mr. Royle remarked it in their journey before adverted to. The few organic remains hitherto found imbedded, belong to living species. The following is the analysis of "Kankar"‡ (nodular limestone) by Mr. Prinsep.§

Water of absorption	1.4
Carbonate of lime	72.0
Carbonate of magnesia	0.4
Silex	15.2
Alumine and oxide of iron	11.0
	100.0

Kunkur, or nodular limestone, has been likened to the cornbrash of the English strata; but its geological position (principally superficial), and the absence of characteristic fossils, present insuperable objections to their identity.||

Granite.—The late Dr. Voysey states, that he "had reason to believe, partly from personal observation and partly from specimens "obtained from other sources, that the basis of the whole peninsula "of India is granite; he had traced it along the coast of Coromandel, "lying under iron clay (laterite); also in the bed of the Godavery "river, from Rajamahendri to Nandair; and he had specimens from "the base of the Sitabaldi hills of Nagpoor, from Travankur, Tinne-"velli, Salem, and Bellari." Mr. Stirling in his memoir on Cuttack says, "The granite where my specimens were principally collected "appears to burst through an immense bed of laterite (iron clay) "rising abruptly at a considerable angle".¶ Major Franklin adds to the above quotation, "the plains of Bundelkhund attest that granite is

* Gleanings of Science, vol. i. p. 169. † Ibid. vol. i. p. 365. ‡ Properly *Kunkur.*

§ Gleanings of Sicence, vol. i. p. 278.

|| Kankur seems to be a sedimentary rock, resembling the *travertine* of Italy; some is ancient, and some modern and still forming. For Dr. Benza's opinion of this substance, see Madras Journal No. 12, pp. 15, 27.—Editor *Madras Journal.*

¶ Phys. Class, Asiatic Researches, p. 37.

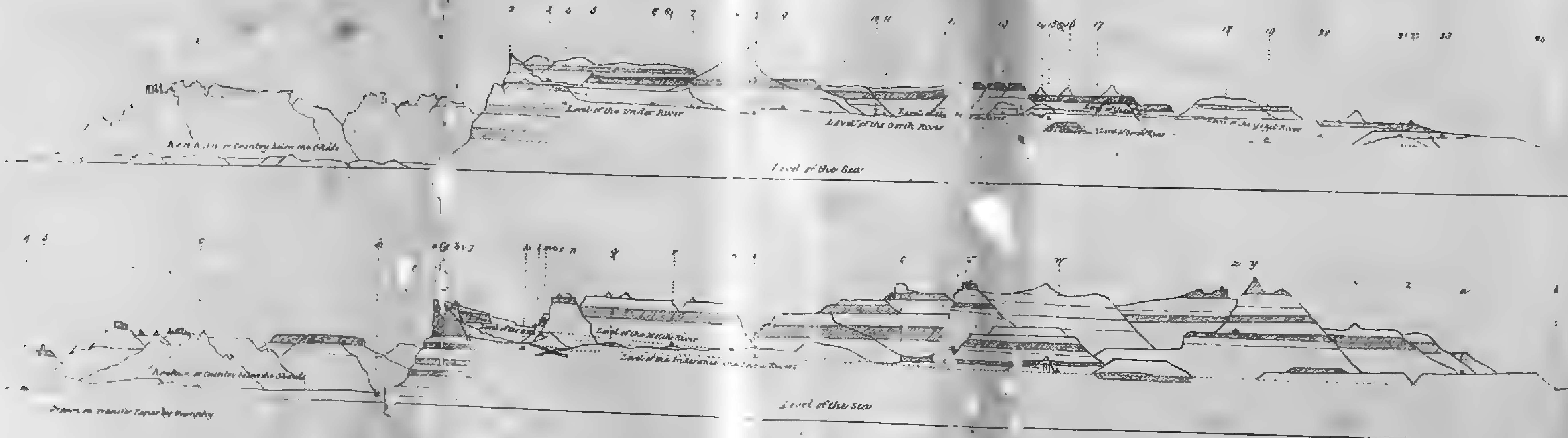
"there the basis rock." Ceylon is exclusively granite and gneiss; finally, I observed granite rising through laterite at Calicut on the Malabar coast. With these facts before us, we can scarcely question the truth of Dr. Voysey's opinion; an opinion involving the belief, with reference also to the extent of trap, that the whole peninsula of India and Ceylon, covering an area roughly calculated of 700,000 square miles, is of igneous origin.*

Sedimentary Rocks.—I am not aware of the existence of any sedimentary rocks in western India, south of Baroach, excepting such as have probably originated in the consolidation of comparatively recent alluvium.

Recapitulation.—I close this paper with a recapitulation of the characteristic geological features of the peninsula; namely,—the amazing extent of the trap region, and the horizontal position of its stratified beds the granitic basis of the whole country; trap veins in granite; the absence, as far as is known, of that uniform series of rocks which constitutes the formations of Europe; the extended and peculiar nodular limestone and laterite formations; the occurrence of pulverulent limestone in seams; and finally, the non-discovery hitherto of the fossil remains of extinct animals within the limits of the peninsula.

A few words are necessary in explanation of the sections (Plate 9) which accompany this paper. They represent two principal spurs from the ghats, and converge to the same point at the junction of the Goreh and Beema rivers. In strictness they are not sections;—ramifications of the spurs, and hills at short distances north and south of the central vertical plane being inserted: they partake, therefore, of a slightly perspective character, but this does not affect the general correctness of their geological features. Fig. 1. comprises the range of hills between the Under and Beema rivers, and has a length of about seventy-five miles. Fig. 2. shows the mountains between the Bore ghat and the source of the Mota river, and extends nearly eighty miles. The len gth and elevation are expressed by different scales, and from this cause the outlines of the mountains are not rigidly correct. A bare outline is traced from the ghats westward to the sea, for the purpose of showing

* More extended observation proves this universal prevalence of granite. Dr. Benza found it at the summits of the Neelgherries, and in the plains, and we have specimens from the Goomsoor mountains on the eastern coast, and from very many other localities. —Editor *Madras Journal.*


Level of the Sea
Level of the Sea

the curious forms of the weathered basaltic caps and ridges of the mountains in the Konkun.

The elevations were determined either barometrically, or thermometrically. Those marked "B." in the subjoined description are barometrical, and result from simultaneous observations with previously-compared barometers; all the necessary corrections having been applied, for temperature, moisture, and latitude. Those marked "W." were obtained by ascertaining the boiling-point of water at different elevations with delicate thermometers: they are not to be relied upon within one hundred feet, although in some instances, when tested by barometrical measurements, they corresponded within a few feet.

DESCRIPTION.

Fig. 1—Elevation and declination of the country above the ghats, between 73°, 35′ and 74° 49′ east longitude, and the parallels of 18° 50′ and 19° 10′ 31″ north latitude: shewing the geological structure of the same.

1 —Mullunghur.
2 —Hill at Ahopeh, 3525 w.
3 —Ahopeh, source of the Goreh river.
4 —Neelsee, 2326 w.
5 —Beema Shunker, source of the river Beema, 3090 b.
6 —Pahtun on the Goreh, 2242 b.
6½—Ambolee, 2279 w.
7 —Mhou, 2104 w.
7½—Tulleghur.
8 —Ambegaon, 2044 w.
9 —Warreh, 2123 w.
10 —Dyke near Ombreh.
11 —Ombreh, 2081 w.
12 —Goreh, 2028 b.
13 —Mahloonga, 2094 w.
14 —Kheir, 1963 b.
15 —Chakun, 1936 b.
15½—Pait, 2482 b.
16 —Munchur, 1877 w.
17 —Dyke at Digghee.
18 —Pabul, 2035 w.
19 —Kowta, 1830 b.
20 —Cheencholee, 1871 w.
21 —Serroor, 1742 b.
22 —Kurdeh, 1873 w.
23 —Neerwee, 1704 w.
24 —Bed of Goreh and Beema rivers, at junction 1499 w.

Fig. 2—Elevation and declination of the country above the ghats, between 73° 35′ and 74° 49′ east longitude, and the parallels of 18° 28′ and 18° 50′ north latitude: shewing the geological structure of the same.

a.—Panwell at high water mark.
b.—Panella.
c.—Choke.
d.—Campolee, 240 feet w.
e.—Hill above Kundalla, 2694 w.
f.—Kundalla, 1743 b.
g.—Source of Moteh river, 3136 w.
h.—Hill fort of Koaree, 3163 w.
i.—Village of Koaree, 2525 w.
j.—Slanowlee, 1949 b.

k.—Ambegaon on the Powna river, 1831 w.
l.—Yagruh on the Moteh river, 2466 w.
m.—Karteh cave, 2531 B.
n.—Karleh travellers bungalow, 2016 B.
o.—Hill fort of Loghur, 3382 B.
p.—Dykes in Karleh valley.
q.—Borkus on the Molah river, 2083 w.
r.—Moteh, 100 feet above Moteh river, 2156.
r 2.—Wurgaon, 1981 B.
s.—Damun on the Powna river, 1785 w.
t.—Panowleee on the Powna river, 1783 B.
u.—Adkunwaree at foot of Singhur, 2277 w.
v.—Hill fort of Singhur, 4162 B.
w.—Poona, (Colonel Sykes' house), 1823 B.
x.—Pait at foot of Hill fort of Poorundhur, 2950 B.
y.—Summit of Hill fort of Poorundhur, 4472 B.
z.—Bed of Beema and Moteh Mola rivers at the junction, 1703 w.
a.—Neerwee, 1704 w.
b.—Bed of Beema and Moteh Rivers at the junction, 1499 w.

The shaded parts are basalt of various kinds; the unshaded are varieties of amygdaloid, quartz, zeolite, &c. &c.

Of the Panoramic sketches, Plate 8, No. 1. is a distant view of the mountains, on which are situated the celebrated hill forts of Jewdun, Hurreechundurghur, Koonjurghur, and Sewneir, in which Sewajee, the founder of the Mahratta empire, was born. It is taken from the hill N. of the town of Goreh.

No. 2. is a view of the hills, to the north and east, as seen from Lakungaon in the flat broad valley of Jooneir (Sewneir).

No. 2.* is a continuation of the view No. 2, from the N. round to the west.

No. 3. a sketch of the hills, to the north and east, as seen from the summit of the armoury, in the fort of Ahmednuggur.

No. 4. is a sketch of the northern flank of the plateau, on which the city of Ahmednuggur stands; as seen from Wamooree, in the plain of the Godavery river.—*Transactions of the Geological Society of London. Second Series, Vol. IV, page* 409—432.

2.—*A Statistical and Geological Memoir of the Country from Punah to Kittor, South of the Krishna River.**—*By* JAMES BIRD, ESQ. M.R.A.S., F.R.G.S. *of the Bombay Medical Establishment.*

Some hasty observations, collected during a rapid march that I made in 1824, between Punah and Kittor, gave rise to this memoir, which, though brief and imperfect, may not altogether be devoid of interest, since the geology and statistics of few countries are less known than those of India. Connected as this portion of the globe now is with the political and commercial prosperity of Great Britain, the resources of the country, the mineral treasures of its rocks, the capabilities and productions of its soil, the condition of the inhabitants, and their prospect and means of attaining a higher scale of civilisation, deserve the attention of the legislator, merchant, philanthropist, and man of science. Its statistics and geology are yet desiderata: and though the portion of information here communicated be but a speck on the ocean that lies before us, it will perhaps contribute something towards a clearer view and more accurate chart of the whole, which may be brought, I hope, to perfection in the course of time.

The nature of the soil and appearance of the country.—Two routes may be followed in going from Punah to Kittor. The first lies in the immediate vicinity of the Krishna river; and, after crossing and recrossing it several times from the neighbourhood of Satara to the village of Yerur, meets the other route which lies farther north. It leads through the towns of Sangli and Merich; but, as the vicinity of the Krishna is one unvaried scene of cultivation on a level surface and dark sandy soil, it requires little notice. The other remains to be described.

From Punah to Kittor, the road runs in a south-east direction, parallel to the west coast of India; the Ghats, or western Vindiya mountains being on the right-hand, as the traveller proceeds southward. This route crosses the Krishna, Ghatparba, and Malparba rivers, besides a few others of lesser magnitude, of which the course indicates a southern declination of the country. The two latter rivers, flowing north-easterly for some distance, indicate a partial declination in that direction.

The country within this tract, though comprehending a great variety of soil, may be divided,—1st, Into the table land of the Dekkan,

* We have introduced this paper as an appendix to Col. Sykes' memoir, as it offers further interesting particulars regarding part of the same tract.—EDITOR, *Madras Journal*.

terminating near the town of Pusasaoli and at the Nahwi Ghat, or pass from the high land to the plain below; 2dly, Into that stretching from hence to the Ghatparba river; and 3dly, The tract between the Ghatparba and Kittor.

The parts now subject to British authority are the territories composing the Punah collectorate, and extending to the west bank of the Nira river, the country of the Satara Raja, which is more or less under the control and management of the resident at that court, and the taluks of Padshapur and Belgaum, at present under the authority of the political agent in the southern Mahratta country. The remainder is divided among the southern Jagirdars, and other tributaries of the British government, which exercises no control over its territorial management.

The Dekkan division, during the dry season, has a very bleak appearance. In travelling southward we continue to pass over chains of barren hills, with flat tops, which occasionally assume conical forms, but never exceed, I think, the moderate height of fifteen hundred feet. Their sides are neither abrupt nor sloping, and are covered by numerous blocks of black rock, which, in the interior of the mountains, appear to have a tabular arrangement, giving them, at a distance, a fortification-like aspect, as if one circumvallation, contained within another, ascended from below.

Only a few stunted bushes are found growing on these hills. The principal of them are different species of mimosæ, the carissa carandas, the flacourtia sepiaria, and the aula of Hindustan.

Between the hilly chains narrow valleys are formed, of which the soil is generally light and gravelly, being ill adapted for any cultivation but that of bajri* and juari,† which require the assistance of a plentiful monsoon. From the scarcity of rain, however, during last season, the crops had not attained more than half a foot in height, though it was now the month of November, and would be totally lost in consequence.

At the village of Jejuri, instead of the continued mountain chains running east-north-east, with narrow openings between, the hills are disposed in a circular manner, like an amphitheatre, and form corresponding valleys. The only produce of these hills is a species of euphorbium called "chuppal shein."

From Jejuri to the banks of the Nira river the country is poor, and the soil is little more than the *debris* of the rocks. But, on approaching the Nira, this becomes black and very susceptible of cul-

* Holcus spicatus. † Holcus sorgum.

tivation, if the round stones scattered over its surface were only removed. The village of Lonud, on the east bank of the Nira, and only a few miles distant, is surrounded by many fine fields well supplied with the means of irrigation and producing abundance of vegetables. The great defect in the agriculture of this part of the country is the want of inclosures, which might be made at little expense, the prickly euphorbium and nerium-leaved being found close at hand for this purpose. Such inclosures, both here and in other parts of the Dekkan, would be a great improvement, since they would defend the vegetation against the strong north-east wind which blows nearly one half the year, and, from its drying influence, robs the soil of its natural moisture and deprives the plants of benefit from the dew.

Beyond Lonud, we enter the Salpa pass, and come to the valley of Satara. Here the soil is much richer than that previously met with, being black and alluvial. It rests on a very deep substratum of grey earth denominated *chunkar*, from its containing *chuna*, a calcarious carbonate.

A more plentiful supply of rain in this district had favoured the crops, and the appearance of the country, from its verdure, was pleasing to the eye. The hills, which were green to the tops and covered with brushwood, offered an agreeable contrast to the bleak and barren parts of the country just passed over.

The situation of the village of Deour, in this valley, is romantic and beautiful. It is built on the south-east bank of a deep nulla, which forms a branch of the Wasna river, of which the banks are high and earthy and the bed gravelly. The wild oleander grows in abundance close to the water edge; and, at the village, a variety of fine trees rise in majestic grandeur and afford a desirable shade from the noon-day heat of a tropical sun. The houses here are also better built than those usually met with in this part of the Dekkan, and are neatly roofed with flat tiles. The general direction of the streams flowing through this valley is south; those previously met with being north.

From Deour to Pusasaoli is two stages, and the road leads through the Nạhwi Ghat. The hills near the Ghat became broken, and the country beyond Pusasaoli is flat, only one or two solitary hills being visible for some distance.

Pusasaoli, which is a large town, contains a good bazaar, and supports a manufactory of black kumlies* for the Satara market.

The different kinds of soil known here are a dark brown one called "tambra," and a gravelly earth denominated "sherwut" or "karrak,"

* A sort of blanket.

according as it contains a less or greater proportion of *chuna.* The substratum of the former is trap in a state of decomposition; and of the other, trap with beds of *chuna.*

The first differs but little from the soil of Gujarat, called by Mr. Marshall kali-bhui, of the lower level. It is adhesive and cracks by drying; but, if irrigated, may be cultivated with chuplagheon.*

When the field is ziraut, or dry land, "harbarri jundla"† and shetgheon,‡ may be raised during the cold weather on this kind of soil; but bajri is its most common produce, which comes to perfection in the rainy season. The other kinds are usually cultivated with kardu|| and karli.§

The neighbourhood of this town presents extensive fields of good black soil in a waste state, which have not been cultivated on account of the almost total absence of rain during the last two seasons. The fields on the east side only were in use, as abundance of means from nullas and wells exists there for irrigation.

Parts of the country comprehended in the second division are equally barren as those that have been described in the first; but the rich and beautiful fields on the banks of the Krishna, amply compensate for the few miserable villages and unproductive lands which we meet with near the Yerla river.

Among the latter the village of Aundhli was the most poor and desolate. The soil, which is here very sandy, rests on a bed of gravel, and produces nothing without the assistance of a plentiful monsoon; from the failure of which, last season, an almost total absence of vegetation became the natural consequence, and the inhabitants, with the exception of a few, had deserted the village.

The distinctions of the soil known at this place are "changli kali zamin," or pure black earth, which is a tolerably rich black mould from three to four feet deep, resting on another of a grey colour, which contains much *chuna.* It is divided into the dry and garden lands; but of the latter there are very few near Aundhli, and these are usually assessed at twelve rupees per bigah. The next kind of soil is that known by the name of "marut," which is a black earth of a reddish tinge resting on gravel, and is usually two feet deep. This is generally cultivated with sealu,¶ and is taxed from six rupees and a quarter to seven and a half. The last of the soils is "karrak," which, like the former, rests on a bed of gravel, but is seldom more

* Triticum monocum.

† Cicer arictinum.

‡ Triticum spelta.

|| Carthanus Persicus.

§ Verbesina sativa.

¶ Holcus saccharatus.

than a foot in depth. It is divided into a better and worse kind, according as the proportion of grey calcarious earth be more or less to the quantity of stones and gravel. It commonly lets from a rupee and a quarter to a rupee and a half, and is cultivated with different kinds of oil plants.

As we approach the banks of the Krishna, the country lies before us one extensive plain to the south-east and north-west, whilst the ridges of hills on the north and south are barely visible and at a distance. The banks of the river, which are deep and shelving, are composed of black earth with mixed sand. The greater part of the soil on the north or left bank is of this description, but that on the right or south bank is more gravelly.

From the Krishna river at Yervoi, to the Ghatparba at Argul, the country undulates, and presents here and there hilly ranges of broken basalt. Some parts of it consist of extensive plains covered by a little stunted grass, serving as pasture to numerous flocks of antelopes, where only a few patches of scanty cultivation may be seen about the villages, and nothing can be expected in the way of improvement when the poorness of the soil, and the want of water, are inseparable obstacles to all attempts at cultivation.

On the banks of the Ghatparba the hills of Padshapur became distinctly visible, and have a beautiful green appearance from being covered by thick jungle to the top, announcing at once the great difference of the country we have now approached from that we have left behind.

The greatest length of the hills appears to be from east to west, but the fine valleys, surrounded by them, open to the north and south. It is in this direction, also, that the Ghatparba flows to form the falls of Gokauk, which will be noticed after having described the appearance of the country through which our route lay. The valleys between the hills are very fertile and highly cultivated. Many of the fields have been reclaimed from a state of jungle waste by cutting down and burning the brushwood ; and much more in this way remains to be done, but can only be performed by those who have capital, and to whom, therefore, liberal encouragements should be held out. The soil is light and gravelly, but capable of producing rich crops of sealu and tur.*

Near Belgaum the country again becomes undulating, and the low sloping hills which here diversify the landscape, are covered by a deep stratum of black earth to within a few yards of their summits.

* Citysus cajan.

Amygdaloidal pieces of broken basalt may be found on the surface of their greatest ascents, and numerous springs of good water are seen percolating through the amygdaloid rock composing the interior of the hills. The small streams flowing from thence, when obstructed in their course, form bogs, where a continued annual production and decay of water-plants causes an accumulation of the soil.

But in situations where the water is in sufficient quantity to reach the hollows and lower grounds, it is then retained by means of a bund or dam, in order that the field may be cultivated with rice. The soil of these hollows is black and alluvial.

In other places the soil of Belgaum, which is red and ferruginous, proves very inimical to healthy vegetation. The mango trees, which are very numerous in this vicinity, soon become dry and withered in appearance, and never acquire that beautifully conical form which they invariably assume in a more favourable and natural bed. The country for many miles to the north-east, is composed of marshy ground, and is cultivated in the monsoon with rice, and in the cold season with harbarri.

From the village of Chota Bagwari, fourteen miles beyond Belgaum, the red ferruginous soil may be found at the base of the mountain ridges until we reach Kittor, where the hills have flat tops, and are covered by thick jungle instead of pasture grass, as at Belgaum. They are composed of a stratified rock shewing alternate white and brown stripes, of which the extraordinary magnetic property will be described in the mineralogy of this part.

Water is here less abundant in the high land than at Belgaum, but is in greater quantity both in the tanks and nullas. Rice is always cultivated on the low lands, and sealu is the usual product of the higher level.

Falls of Gokauk.—This cataract, which is formed by the stream of the Ghatparba river, passing over a perpendicular quartz rock of a hundred and seventy-six feet, receives its name from the old fort of Gokauk, now in ruins. From this it is distant about two miles; is nearly ten miles east of the town of Padshapur, and about a mile from the village of Kanur. The Ghatparba here flowing east-south-east, not finding a passage north-eastwards through the body of the quartz sandstone hills of Padshapur, has forced itself in a southern direction, and passes into an extensive plain of which the declination is southerly.

In the dry season the body of water forming the fall is not very

considerable; and the stream, after being broken by an intermediate projection of the rock, descends in two separate columns to a semicircular basin of still water. It has, then, nothing very grand in its appearance similar to what is told us of Niagara; but, in picturesque beauty, may bear a comparison with the other celebrated cataracts which have engaged the attention of travellers. The whiteness of the descending columns; the glittering rainbow appearance of the dazzling sun-beams on the silvery spray; the murmuring noise of the water falling into the clear still basin below; the black rugged appearance of large square blocks of perpendicular quartz rock abounding in the bed of the river; and the natural loneliness of the surrounding jungle, conspire to leave behind impressions which may be better felt than described.

When, however, the stream of the Ghatparba has been swollen by the rains of the monsoon, the cataract will be seen to greater advantage. The breadth of the river at this time cannot be less than a hundred and eighty yards, and the sheet of descending water must form a grand and magnificent object.

Even the apathetic Hindu could not here contemplate unmoved the majesty of nature, having recorded his admiration of her works by erecting a temple on either side of the cataract; and dedicating them to that God who, in his creed, possesses supreme power in nature's destructive operations.

Where the quartz sand-stone hills ascend from the river there is a Mahadeva temple built on each bank, which, judging from the style of the architecture, may lay claim to considerable antiquity. The roofs are formed of long flat slabs of quartz rock, supported by short thick pillars of the same, and must have been constructed at great trouble and expense, when we consider the hardness of the materials composing them. The general figure of the temple is oblong; and each consists of only one story having several smaller side ones. They, therefore, differ from Hindu temples of modern erection, which are usually pyramidal, and have several stories diminishing in succession to the top.

The rock in the bed of the river, and near the edge of the cataract, has been formed into deep circular holes of two to three feet in diameter, which have been apparently formed by the eddies originating in a stream of water, that, meeting with resistance, receives a circular motion.

From the brink of the semicircular basin, hollowed out by the falls, we descended to the water edge in order to view the cataract

below. The path lies on the right-hand side between vertical columns of quartz rock; and the breadth of the passage is only sufficient to allow of one person going at a time. The opening leading into this from above is so low that it was necessary to creep on our hands and knees to get through. The loose blocks of rock wedged between the perpendicular columns, and forming its roof, hung over our heads like the sword over Damocles, keeping us in continual apprehension that the frail means of support giving way we might be crushed by their fall.

On descending to the water edge the cataract is seen to less advantage than when viewed from above, the rainbow appearance being no longer observable. The echoing noise of the falls, however, is grand and impressive; and the large square masses of stone which have been hurled below by the rains of the monsoon, or the roots of the jungle plants penetrating fissures of the rock, lead us to think on the slow and silent influence of time midst this depth of solitude.

The scenery about the cataract is worthy of admiration; and, in concluding this account, I may venture to say, that if a traveller's expectations are not fulfilled by a visit to the spot, his curiosity will at least be gratified.

Mineralogy of the country.—The elevated table-land of the Dekkan is exclusively composed of rocks belonging to the fletz-trap formation. The hills which rise on the western ghats as a base have conical or tabular forms, and are sometimes distributed in long ridges or terraces which run east-north-east.

At the openings in the hills west of Punah, known by the name of the Ghats, and which are the passages from the lower land of the Konkan into the higher land of the Dekkan, these tabular forms are grand and beautiful. They are generally triangular shaped, and insulated from each other by broad and deep ravines, of which the perpendicular descent cannot be less than twelve or thirteen hundred feet.

The rock composing these tables is compact basalt of a black colour, in which hornblend predominates.

About Punah, and further south-eastwards, the rocks are generally amygdaloidal, and become lighter in colour the farther they are removed from the western entrance. This amygdaloid is in no respect different from the toad-stone of extra tropical climates. It shews embedded masses of chalcedony, zeolites, and green earth; and in the neighbourhood of water courses, at the depth of five-and-twenty or

thirty feet below the surface, contains drusy cavities of crystallized quartz, the appearance of which, in digging wells, indicates that water is near.

A clay-iron ore, of a dark-brown colour, is found at this depth; and is sometimes penetrated by circular canals, which have been pervious to water.

The amygdaloid rock, accompanying the iron ore, is similarly penetrated; but its canals are filled up by spiral pieces of white chalcedony.

Calcarious carbonate, denominated chuna, abounds on the banks of the water courses; and is seen occasionally in alternate strata with an impure bole, called by the natives "geru." Chuna is also found, in the form of calk-tuff, in the beds of the nullas; and is seen venegenous in the basaltic and amygdaloid rocks at the village of Lonud, where calcspar is also found in veins.

Green-stone, heliotrope, agates, and horn-stones, are to be met with in the beds of the nullas, and on the banks of rivers.

On the surface of the amygdaloid, and immediately below the soil, specimens of rock crystal are occasionally discovered. They are attached to the quartz veins, which run through the amygdaloid of the Dekkan east and west, corresponding in this respect with the hills of quartz-rock, which we afterwards meet with at Padshapur. The basalt of the Dekkan occurs both in columnar and globular forms, and varies in colour from a bluish grey to a deep black. The latter kind is capable of receiving a high degree of polish, and is employed by the Hindus for the interior of their temples.

Along with the basalt and amygdaloid, there is a determinately aggregated rock of a grey colour, which is found in beds: its structure is porphyritic; and the disseminated crystals appear to be felspar, sometimes associated with calcspar. A somewhat similar rock, but of a red colour, is also distributed in beds through these hills. Of this the structure is amygdaloidal.

Where the formation is traptuff, common opal is to be met with.

From Pusasaoli to the banks of the Ghatparba, the mineralogical nature of the country is little different from what has been now described. Chalcedonies are fewer, and columnar basalt becomes less common the farther we go to the southward. Jaspery clay-iron ore and red hematite appear more frequent, and are particularly abundant near the town of Mulgaon.

At the village of Argul, only a few hundred yards from the north bank of the Ghatparba, the country changes. The rock here has some likeness to sandstone, but is in fact aggregated quartz-

rock. It forms whole hills, of which the long diameter extends from east to west. The structure of this rock is extremely hard, and in appearance it varies from a secondary sandstone to that of pure quartz.

This quartz-rock formation extends as far as Belgaum, where we again meet with the amygdaloid. The undulating ground here, which is of inferior height to the hills of broken basalt, is composed of a red clay-iron-stone or laterite. It is sometimes of a yellowish colour, soft, and in a state of decomposition, from the action of the weather: in such instances it has much resemblance to iron rust. In either case it is hard and undulated, forming an aggregated rock which is used for building.

From Belgaum to Kittor we meet with numerous pieces of iron ore scattered over the surface of the ground. They are most abundant where the soil is red; and are chiefly to be met with near the hills lying south-east from Kittor. Some specimens of the ore are bubbled, having the appearance as if they had suddenly cooled while in a state of fusion. From the mixed nature of the rocks found in this part of the country, quartz, iron-stone, and basalt, being indiscriminately huddled together, I am inclined to think that some strong convulsion of nature must have produced this at some time or other; and the generally bubbled appearance of the rocks warrants this conclusion. Specimens of black quartz are found among these rocks.

In the immediate vicinity of Kittor the structure of the rocks is coarse slaty. They are composed of alternate layers of quartz and iron ore, varying in thickness from the sixteenth-part of an inch to that of a whole, which gives the rock a striped appearance.

The effect which this rock produces on the magnetic needle is, however, the most extraordinary part of its nature. It has no inherent magnetic power, since it does not attract steel under any form; but when cut into a parallelogramical figure, of which two sides are longer than the other two, as here represented, it exhibits great power over the needle of a small pocket compass.

If the side A B be presented to the north pole, it repels the needle; but when brought round to the south pole, it attracts it. When the side C D is presented to the north pole, the effect is *vice versa*; and if the stone be moved circularly over the glass of the compass, the needle is set in motion.

It would appear, therefore, that this rock possesses polarity, but does not exhibit any magnetic power in attracting simple steel. The ore it contains is probably magnetic iron ore; and the well-ascertained

fact in magnetism, that two magnets having a free motion will attract when different poles are directed towards each other, and repel when the adjacent poles are of the same name, seems to explain the phenomena.

*The cultivation of pán**.—The agricultural productions which are in general use among the people of the country having been already incidentally mentioned, I here pass over to others less frequently cultivated; and will now give some account of the cultivation of pán.

This leaf which is in very general use among all classes of Hindus, and is chewed by them with supari, is the produce of a creeping plant, which has been denominated a vine. It has a light-green colour and sub-astringent taste, having a degree of pungency which at first excites an increased flow of saliva, but which diminishes, by repetition, the secretions of the mouth, and parches the tongue and fauces.

In using it, a few bruised pieces of the areca-nut, with two or three grains of ilachi,† and a small proportion of carbonate of lime, are wrapped up in one or more leaves of the plant. The whole is then chewed by the natives of India, from the same bad influence of example which has given tobacco a similar station among the inhabitants of Europe.

In the cultivation of pán, both wind and sun are carefully excluded, and a cool shade is studiously preserved for the rising plant. With this view an acre or more of ground is inclosed by a double hedge of thuhar,‡ or closely-bound twigs; and the natural black soil of the place has its capacity for retaining moisture increased, by the addition of a considerable quantity of red argillaceous earth. This fact is practically well known to the pán cultivator, who is generally of a Hindu cast named Tirghul, and is supposed to have originally emigrated to this part of the Dekkan from the Carnatic.

The ground being now ploughed, and manured with horse-dung, if procurable, is smoothed by the harrow; and is then considered to have undergone sufficient preparation for receiving seeds of the sheoga,§ hutga,|| and neemb¶ trees, which grow up as the future supporters to the plant, and intended to serve after the manner of hop-sticks in England. These seeds are usually sown, at the end of the monsoon, in parallel rows of two feet wide; but sometimes a greater distance is left when the garden ground has not been divided into beds,

* Piper-betel.
† Cardamomum minus.
‡ Euphorbia neriifolia.
§ Hyperanthera moringa.
|| Coronilla grandiflora.
¶ Melia azadirachta.

by which it is intended that there shall be sufficient room to allow of the operations of weeding and irrigation being conveniently performed.

On the trees springing up, some of them are removed; and in the middle of January, when the remainder have attained a foot or two in height, pán slips are planted near each supporter, and from this date frequent irrigation of the garden becomes necessary. Generally two or more slips are inserted, which, according as they thrive, are afterwards thinned; while, at the same time, the space of a foot and a half is left betwixt each supporter.

The remaining operations are training the pán to its supporter, renewing the red soil, and repeating the manure once a year.

The expense of making a pán-garden of this kind is estimated from four to five hundred rupees, inclusive of the expense of keeping it up until the second or third year, before which time there is no return. The pán plants are not exhausted before the eighth or ninth year, but are deemed most valuable during the sixth and seventh, the leaves being then in perfection.

Religion and classes of the inhabitants.—The Brahmans, who are divided into the Konkanist, Deshist, and Karradi sects, form but a small proportion of the inhabitants of the country, and are to be chiefly met with in the neighbourhood of great towns, where they have hereditary right in the soil. They are in great numbers on the banks of the Krishna; and guided, as would appear, in their choice of settlements, by an idea of comfort, or the hopes of gain, are therefore less numerous in the Dekkan division than further south, where a greater field is open to their ambition, from the country being under the protection of men of their own class. Those of the Sudras practising trades, and who are divided into as many tribes as there are arts among them, also bear a very small proportion to the great body of the people, which is composed of common Mahrattas and Lingaiyats.

The common Mahrattas, who are cultivators, are principally met with extending from the Dekkan as far south as Tasgaon; and the Lingaiyats inhabit the country from hence to Kittor. The language of the former ceases to be generally spoken after passing Tasgaon; and the Kanari is then universally used by the lower orders of the people.

Many of the Lingaiyats are employed in trade, and are, indeed, the principal merchants on the banks of the Krishna. They pretend to high degrees of purity, and carefully abstain from eating fish or flesh—a practice not so religiously observed among the common Mahrattas.

The only object of their worship is the ling, "simulacrum membri virilis," which they generally keep suspended from their necks.

They perform this worship in the Mahadeva temples; but in those only where there is a separate and distinct apotheosis of the *ling*. The ceremonies of their religion are conducted by the viragis, acting under the superintendence of the Brahmans, at the Mahadeva temples; and they are not, as the name implies, simply religious mendicants, who, from choice, have abandoned the concerns of the world; but are the pretended offspring of the god. According to my information, every woman who, being barren, pays her addresses to the temple, and is blessed with offspring, devotes one of the children to the service of the deity; and, in the event of that child being a male, he becomes an officiating priest among the Lingaiyats.

It is almost unnecessary to remark the degrading superstition of such a religion; for however pure may have been the original metaphysical idea of the institution of the lingam, the effect now speaks for itself.

At Yerur, on the Krishna, the Lingaiyats have a celebrated temple, liberally endowed with freehold lands for the support of the Brahmans and dancing-women. It is dedicated to MAHADEVA, and is celebrated for two deifications of the ling; one in its generative capacity, named VIRABHADRA, signifying the prosperous hero; the other in a destructive capacity, named VIRAPATERA.

The Jainas are also met with in considerable numbers south of the Krishna. Their establishments are monastic, as the Jainas live in a manner separated from the other inhabitants of a village. Their houses, congregated together, and opening into a square court, are surrounded by a wall, within which stands a temple for the community, where PARISNATH is the chief object of worship.

The Jainas are mostly engaged in trade, and appear in their manners to be less influenced by superstitious observances than other Hindus.

Condition of the People.—Muhammedan history has informed us, and the experience of our time serves to confirm it, that the Dekkan has been at all times more subject to famine than most other parts on the western coast of India. This happens, as would appear, when the lighter and upper strata of the clouds are carried over that elevated table-land by a strong south-west monsoon wind. The heavier and inferior strata, when attracted by the lower country and hills of the Konkan, descend in rain; so that, none being left for the parched lands of the Dekkan, famine is an inevitable consequence; and the

miserable inhabitants, forsaking their homes to seek for food and shelter in the neighbouring countries, extend the evils which follow a partial monsoon.

After a favourable rainy season, however, the Dekkan teems with grain; though such is the irreparable loss caused by a bad one, that several prosperous years can scarcely bring with them a recompense. The little property of the people is expended in retaining their existence: their cattle die for want of food. There are few of them so provident as to think of laying in a stock of grass from the Konkan against a bad season; and their fields remain uncultivated; as they have not the means of doing so without getting more deeply in debt to an artful set of foreigners, the Gujar and Marwari Banias, who come here intentionally to raise a fortune, and take every advantage of the poor cultivators which chance throws in their way.

This is not a fanciful picture, and is a state of things obvious to all making the inquiry; for the evil has been demonstrated by the fatal experience of the last two years, in the former of which but little rain fell, and almost none during the latter. I have ascertained, by repeated inquiry, that when many of the villagers are pressed for subsistence in the hot season, it is usual for Banias to advance grain, on the condition of its being repaid double when the ensuing harvest ripens. The crop, therefore, raised by the cultivator is actually in the hands of the Bania before it has been cut down; and as the cultivator is his dependent, he has no remedy but to run again the same course.

In a country like the Dekkan, so liable to have alternate good and bad seasons, a wide field is open for the intrigues of such men; and the evil of the system is too great not to require a check from the legislature,—when it is an observation, not alone applicable to the natives of India, that men get into debt in proportion as the means of doing so become facilitated.

The government and its officers are much disposed, no doubt, to ameliorate the condition of the inhabitants; and there is reason to think that the mild spirit of British jurisprudence prevails in all that has been done for the country. It is to be feared, however, that its servants, in their over-zeal for the interest of the government, may mislead it, and adhere too strictly to former custom in their assessments of lands. It may also be doubted if the assessment of former governments forms a fair criterion for our guidance; since our executive is so good, and every thing so minutely noted, that the people are deprived of many advantages derived from the grass and waste lands under the negligence of our predecessors.

The inhabitants generally betray signs of great poverty. To see

a silver ornament on the child of a cultivator in the Dekkan, is nearly as rare as it is common in the Konkan. It may be urged, perhaps, that they are thoughtless, spending their money on feasts, festivals, and marriages; and that they are less guilty than other Hindus in this respect, I dare not advance, though I may venture to assert that they are not more so than those in other parts of the country, where there is more wealth and greater comforts. The fault rests not then with them, but with the country where they have been doomed to live; and of this such is the poverty, that it must be assessed lightly until a little capital has been created among the riots or cultivators.

It is a general complaint in the Dekkan, and indeed among all classes of natives, that the country is becoming poorer and poorer every day. That the Hindus are much inclined to make such complaints, and sometimes without cause, is well known; but this is one which is well founded. India is situated, in regard to her commerce with England, precisely as Europe formerly was in regard to India, where large commercial purchases being made by the former to supply the necessities of the state and individuals, little is taken in return by the latter country, which thus drains the other of its specie. This increasing poverty cannot be prevented if resources in this country are not found to render it independent of supplies from England, or its exportable produce be not allowed import there on more favourable terms than those now in force.

In a country, too, like this, where the manure of the dairy is used as fuel, it is difficult to decide what should be done for the improvement of the land. It is known, however, that soil is much improved by stagnant water; and if the natives in favourable situations would be advised to construct earthen bunds for retaining the rains of the monsoon, much of the hilly soil might be converted into tolerable land. Though the inhabitants on the banks of the Krishna appear more comfortable than those of the Dekkan, they were suffering, in common with the latter, from the partial fall of rain during last year.

The country about Belgaum can seldom or ever want for water, when so many springs are flowing from the hills; and as the monsoon both there and at Kittor seldom entirely fails, the lands are very productive, and the condition of the inhabitants good. There is, moreover, a spirit for manufacture among the people in that part of the country, which has, no doubt, bettered their condition, and forms a striking contrast to that of the people farther west.—*Journal of the Royal Asiatic Society*, vol. 2d, pp. 65, 80.

3.—*Abstract of the Journal of a Route travelled by Captain* S. F. Hannay, *of the 40th Regiment Native Infantry, from the Capital of Ava to the Amber Mines of the Húkong valley on the South-east frontier of Assam.—By Captain* R. Boileau Pemberton, *44th Regiment. N. I.**

From the termination of the Burmese war to the present period the spirit of inquiry has never slept, and the most strenuous exertions have been made by the officers employed on the eastern frontier to extend our geographical knowledge to countries scarcely known but by name, and to acquire some accurate information regarding the manners, customs, and languages of the various races of men by whom they are inhabited.

The researches of Captains Bedford, Wilcox, and Neufville, and of Lieut. Burlton in *Assam*, dispelled the mist which had previously rested on the whole of the eastern portion of that magnificent valley; and the general direction and aspect of its mountain barriers, the courses and relative size of its rivers, the habits of the innumerable tribes who dwell on the rugged summits of its mountains, or on the alluvial plains at their base, were then first made the subject of description, founded, not on the vague reports of half-civilized savages, but on the personal investigations of men, whose scientific attainments enabled them to fix with precision the geographical site of every locality they visited. The journey of Wilcox and Burlton to the sources of the *Irawadi* river had proved the absence of communication between it and the great *Tsanpo* of *Thibet*, but they were unable to prosecute their examination further east; and though their researches had extended to a point not more than twenty miles distant from the meridian on which the labors of the Jesuit Missionaries in *Yunan* had been abruptly terminated, the intervening space, and great valley of the *Irawadi* still remained closed against them, and every attempt to enter either, from *Assam* or *Manipur*, was defeated by the jealous vigilance of the Burmese authorities.

It is generally known that the course of the lower portion of the

* Attention has been forcibly drawn, within the last few years, to the countries situated to the north-east of our Indian empire; both on account of the interest and importance of the discovery of indigenous tea plants in Assam, and for the political consequence which these regions possess, from their vicinity to, and relationship with, the great empires of China and Ava. We introduce, therefore, the above paper as a narrative of the most novel and interesting expedition of recent times as regards the East. A route map accompanies the article in the Bengal Journal; but the reader will be able to follow the traveller with the published maps of the country, and to note down pretty correctly the newly described places. —Editor *Madras Journal.*

Irawadi river, or that part extending from *Rangun* to *Ava*, had been delineated by Lieut. WOOD of the Engineers, who accompanied Captain SYMES on his embassy to that Court; and that the features of the surrounding country, the size of the towns, its natural productions and population, had at the same time been investigated by the accurate BUCHANAN. Charts of this portion of the river, extending to *Monchabu*, the capital of the great ALOMPRA, had at a far earlier period been constructed, but the surveys were avowedly made in a manner not calculated to inspire much confidence in their accuracy; and the attention of Europe was first extensively drawn to this field of inquiry by the publication of SYMES, whose exaggerated views of the civilization, power and resources of the Burmese empire were generally adopted, while the more accurate estimates of his successor COXE were treated with comparative disregard.

In the very infancy of our intercourse with the Burman empire, and when the most persevering attempts were made to obtain settlements at various points of the coast, the more remote stations on the upper portion of the *Irawadi* river were not forgotten; and *Bamu* or *Bamo* was even then known as the emporium of a trade between the Burmese and Chinese, in which our aspiring merchants were most anxious to share. It is asserted that, at the commencement of the 17th century, factories were established in that neighbourhood, but the permission to remain was shortly afterwards withdrawn, and the information which it is supposed was then obtained of the surrounding country has never been rescued from oblivion:—this is the less to be regretted as the loss has been fully compensated by the results of recent research; and the journey of Captain HANNAY, of the 40th Regiment Native Infantry, from *Ava* up the *Irawadi* river, to the frontier towns of *Bamo* and *Mogaung*, has at length rendered this hitherto inaccessible region almost as well known to us as the more southern districts, through which this noble river directs its course. Many geographical points of extreme interest have been determined by the personal observation and inquiries of this meritorious officer. *Bamo* has for the first time become accurately known from the same source—much valuable information has been gained respecting the trade carried on between *Ava* and *China* in this remote corner of the *Burman* empire—the habits and localities of some of the principal tribes occupying the mountainous tracts bordering on western *Yunan* have been successfully investigated—the position of the very remarkable valley of *Hukong* has been determined—the *Pyendwen* or amber mines have for the first time been examined by the eye

of European intelligence—the latitudes of the principal towns between *Ava* and *Mungkhong* have been ascertained by astronomical observation with a degree of accuracy sufficient for every purpose of practical utility, and they may now be regarded as established points, from whence inquiry can radiate in every direction with a confidence which the most zealous and enlightened investigators have been hitherto unable to feel in prosecuting their researches, from the want of a few previously well-determined positions at which to commence or terminate their inquiries.

To an act of aggression on the part of a *Singpho* tributary of *Ava* against a chieftain of the same clan residing under our protection, are we indebted for the opportunity of acquiring the information now gained, and the feud of two insignificant borderers may prove the immediate cause of a more intimate communication than had ever previously existed between our recently acquired possessions in *Assam* and the northern provinces of the *Burman* empire.

The Bisa and Dupha Gaums are the heads of two clans of Singphos, occupying the northern and southern faces of the chain of mountains, which forms a lofty barrier between *Ava* and *Assam*. The former chieftain, on our conquest of the latter country, tendered his submission and was admitted within the pale of that feudatory dependence which many other tribes of the same clan had been equally anxious to enter;—he was uniformly treated by the local authorities with great consideration, and was located at the northern foot of the *Patkoi* pass leading from *Assam* to the *Hukong* valley. Between this chieftain and the Dupha Gaum a feud had existed long previous to our assumption of the sovereignty of the country; and the latter, at the close of the year 1835, headed a party, which crossing the mountains from the Burmese province of *Hukong*, entered *Bisa*, the residence of the chief of that clan, and after ravaging and plundering the village, sealed their atrocity with the indiscriminate murder of all the inhabitants that fell into their hands. The circumstances were made known to the British Resident at the Court of *Ava;* inquiry was demanded, and security required against the recurrence of similar acts of aggression. A deputation from the capital was ordered to the Burmese frontier for the purpose of instituting the necessary investigation, and Colonel Burney, the enlightened representative of British interests at that court, failed not to avail himself of the opportunity thus unexpectedly afforded, of attaching an officer to the mission; and Captain Hannay, who then commanded his escort, was selected for the duty.

The party, consisting of the newly appointed Burmah governor of *Mogaung*, of Captain HANNAY and several Burmese officers of inferior rank, with a military escort, left *Ava* on the 22d of November, 1835, in a fleet of 34 boats of various sizes, for a part of the country which had been uniformly closed against strangers with the most jealous vigilance. " No foreigners," says Captain HANNAY, " except the Chinese, are allowed to navigate the *Irawadi* above the choki of *Tsampaynago*, situated about seventy miles above *Ava;* and no native of the country is even permitted to proceed above that post, excepting under a special license from the Government. The trade to the north of *Ava* is entirely in the hands of the Chinese, and the individuals of that nation residing at *Ava* have always been vigilant in trying to prevent any interference with their monopoly."

The mission was detained the two following days near the former capital of *Amarapura*, to complete the quota of troops by which it was to be accompanied, and whose discipline, when they did join, was very soon found to be on a par with their honesty.

" They work their own boats," says Captain HANNAY, " some of which are covered in, and others are quite open. Their musquets (if they deserve the name) are ranged here and there throughout the boat, and are never cleared either from rust or dust, and wet or dry they are left without any covering. Each man carries a canvass bag, which is a receptacle for all sorts of things, including a few bambu cartridges. He wears a black Shan jacket and a head dress or *goung-boung* of red cotton handkerchief, and thus equipped he is a complete Burmah militia man. They appear on further acquaintance to be better humoured than I at first thought them, but they are sad plunderers, and I pity the owners of the fields of pumkins or beans they come across. I have remarked that whatever a Burman boatman eats in addition to his rice, is generally stolen."

Except at *Kugyih*, where there are said to be several Christian villages, of which, however, no satisfactory information could be obtained, the progress of the mission was unmarked by any circumstance of interest, until its arrival at *Yedan*, where they entered the first *kyouk-dwen*, or rocky defile, through which the river directs its course. Lower down, the extreme breadth of the stream had varied from one to two and a half miles, but here its width was contracted to less than a quarter of a mile, with a porportionate increase in the depth and velocity of the current. During the rainy season of the year, boats shoot through these narrow passes with terrific velocity, and the numerous eddies caused by the projecting rocks, add greatly

to the danger of the passage. In this part of their course, the mission frequently met large rafts of bambus descending from the *Shueli* river, and upon them, small baskets of pickled tea, brought from the hills to the south-east of that river. This tea was said to be manufactured by a race called *Palong Paon,* who are under *Momeit.* At *Tsingu,* Captain Hannay saw three native Chinese from *Thengyíchu* or *Mounyen,* and several others in the service of the noblemen of the court, had accompanied the expedition from *Ava* with the view of proceeding to the *Kyouk Tsein,* or Serpentine mines near the sources of the *U'ru* river, west of the *Irawadi.* On the 30th of November the party left the village of *Yedan Yua,* where a perceptible change takes place in the character of the country and river. "The latter," says Captain Hannay, "from covering an extent of miles is sometimes confined within a limit of 150 yards, without rapids or torrents, as I had expected, but almost as still as a lake. In some places its depth is very great being upwards of ten fathoms. It winds through beautiful jungle, in which the *pipal, simal* trees, and bambus, are conspicuous, and it has, generally speaking, a rocky bed and banks, which last rise to a considerable height, and composed of sandstone, which varies from dark to a white and yellow colour." At the next stage, or *Thihadophya,* Captain Hannay mentions a very remarkable instance of the tameness of the fish, which are not allowed to be killed, and are found from about a mile below the village to an equal distance above.

"If rice is thrown into the water from the boat, a dozen fish, some of them as much as three and four feet long, come to the surface, and not only eat the rice, but open their mouths for you to put it in, and they will allow you to pat them on the head, which I and some of my followers actually did. Some of these fish are apparently of the same species as those called in India *guru* and *ruta* : indeed the Hindus who are with me called them by these names. The breadth of head is remarkable, and the mouth very large; they have no teeth,—at least so the people told me, whom I saw feeling their mouths." This spectacle, strange as it must have appeared, was hardly more so than the adventure of the following morning, when Captain Hannay "was awoke by the boatmen calling to the fish to participate in their meal."

On the 1st of December the expedition arrived at *Tsampaynago,* which has been before mentioned as the limit, beyond which, even natives of the country are not permitted to proceed without an express order from the Government. The custom-house or thana is on the

right bank of the river, and *Male myu* which is close to it, contains about 800 houses with many very handsome gilded temples.

The Myothagyi or deputy governor of the town, is also the custom officer, and a tax of 15 ticals per boat is levied on the Chinese coming from *Bamo.* Old *Tsampaynago myo* is situated at the mouth of a small river which flows from *Mogout* and *Kyatpen,* and falls into the *Irawadi* immediately opposite the modern choki of that name. The sites of *Mogout* and *Kyatpen,* where some of the finest rubies of the kingdom are obtained, were pointed out to Captain HANNAY as lying in a direction N. 80° E. of *Tsampaynago,* and about 30 or 40 miles distant, immediately behind a very conspicuous peak called Shueu Toung, which he estimated at 3,000 feet high. The *Madara* river, as well as that of *Tsampaynago,* flows from the same mineral district which must greatly facilitate communication with it. The inhabitants of the country were unwilling or afraid to communicate any information regarding these secluded spots, and their exact locality is still a subject of conjecture. The mines are described as in a very swampy situation, and surrounded at a trifling distance by lofty hills. The three places at which the gems are principally sought, are *Mogout, Kyatpen* and *Loungthe,* and the principal miners are Kathays or Manipuris, with a few Chinese and Shans. The other most celebrated spot is *Momeit,* the site of which BUCHANAN found some difficulty in determining, but which Captain HANNAY learnt was not more than two or three days' journey, or between 20 or 30 miles north of *Mogout* and *Kyatpen.* While at this place Captain HANNAY says, "they heard the people who were cutting bambus in the hills, rolling bundles of them down the face of the steep. Having made a road by felling the trees, the woodmen allow bundles of 150 and 200 bambus to find their way to the bottom, which they do with a noise that is heard at the distance of eight miles. They are then floated down the small river into the *Irawadi,* but this operation can only be effected during the rains." The party now began to feel the cold excessively, and its severity was greatly heightened by a strong northerly wind, which seldom subsided until the afternoon, and was particularly keen in the narrow passes or *kyouk-dwens.*

Tagoung Myu, which was reached on the 5th of December, is an object of peculiar interest, as it is said to have been built by a king from Western India, whose descendants afterwards founded the kingdoms of *Prome, Pagan* and *Ava.* Captain HANNAY found the walls of the old fort dwindled away to a mere mound, and hardly discernible from the jungle with which they were covered; but adds, "that enough

is still seen to convince one that such a place did formerly exist. The fort has evidently been parallel with the river, and is on the left bank which is high and composed of sandstone. About half a mile inland, the remains of the inner walls run north and south, with an opening or gap to the east, in which there is an appearance of a considerable ditch, which I was told is filled with water in the height of the rains. The whole has more the appearance of an old brick fort, than any thing I have seen in *Burmah*, and I should say it had been built by a people different from the present race of Burmans."

About a mile to the south of *Tagoung* are the extensive ruins of *Pagan*, which stretch as far as the eye can reach, and here Captain Hannay discovered impressions of Hindu Buddhist images, stamped upon a peculiar kind of brick composition (terra cotta), and with inscriptions which he imagined to be written in some variety of the Deva-nagri character. The Burmese on the spot were unable to explain their nature or origin, and the learning of an aged priest proved equally incompetent to the task of deciphering them :—they were subsequently, however, submitted to some Burman antiquarians at the capital, by the Resident, whose paper on the subject and a drawing of the images appeared in the 51st No. of the Journal of the Asiatic Society.

At *Shwezi-goung*, a large pagoda among the ruins of *Tagoung*, Captain Hannay obtained an extensive view of the subjacent country, and more accurate information of the site of the celebrated mines of *Momeit* than had been practicable at an earlier period of his voyage. From these accounts it appears that the locality which is said to produce the finest rubies in the kingdom, is about forty-five or fifty miles east of *Tagoung Myu*, from whence it can be reached by a foot traveller in three or four days, and by a laden bullock in ten. A drove of these animals was just about to leave *Tagoung* for *Momeit* on Captain Hannay's arrival, and from the owners he learnt "that after selling their *ngapee* (potted fish) at *Momeit, Mogout* and *Kyatpen*, they proceeded to the country of the Palongs, which bounds the district of *Momeit* on the east, and purchase tea, both pickled and formed into balls, a part of which is brought to *Ava*." The fish, which apparently forms the staple of the trade, is said to be of a remarkably fine description, and is dried in a manner peculiar to *Tagoung*.

On the left bank of the river, between *Henga-myo* and *Tagoung*, the teak tree first begins to appear, and at *Kyundoung* on the opposite side, it is said, that timber is found sufficiently large to form a boat

from a single tree; it grows principally on the western face of the hills, at whose eastern base *Kyundoung* stands. A delay of two days at this village enabled Captain HANNAY to ascend to the summit of the first range of hills, by the road which leads across them to the valley of the *Mu* river: he found it a well-beaten track and great thoroughfare, by which the inhabitants of the country as far west as *Wantha Myu*, are accustomed to convey their supplies of fish, salt and oil from *Kyundoung*, a place apparently of some trade: the bazar contained 50 shops which were large and supplied with British piece goods, uncleaned cotton, silk, and cotton Burman dresses, coarse white cloth and other articles of country manufacture. "Besides these," adds Captain HANNAY, "I saw three Chinese shops, where spirits and pork were sold. The streets were crowded with people from the interior, who had come to make purchases, and amongst them were several Kadús, a race of people of a different origin from the Burmahs, and scattered over the tract of country between this and *Mogaung*. They are most numerous in the districts of *Manli* and *Mankat* situated on the *Meza* river* which comes from the north and west, and runs between the *Kyundoung* range and that called the *Thegyain* range, still seven or eight miles north of our present position. Rice, being the staple of the country, is an article of barter, and is sent in considerable quantities to *Ava*. Cotton, brought from the interior, is also an article of barter, and a good deal of it is sent to *Bamo*, but a part of it is made into cloth on the spot, as I saw several looms at work. Yellow and red cotton handkerchiefs of British manufacture sell here for two ticals a piece, which is about 100 per cent. beyond the price at *Ava*."

To this point of their progress, no diminution in the volume of the *Irawadi* was perceptible, and the channels proved sufficiently deep for the passage of large boats, from which we may infer that all the principal feeders or affluents, which pour their tributary streams into the *Irawadi* were still further north, and had not yet been reached. The first of any importance noticed is, the *Shue li khyoung* on the left bank, the northern branch of which flows from the Chinese frontier town of *Santa-fu*, called by the Burmahs *Mola Santa*, and a southern branch from *Momeit*, the site of the celebrated ruby mines already noticed: the confluence of these streams is represented as occurring at the village of *Laha* about 40 miles from the *Irawad*

* A small stream not more than fifty yards broad, with but little water.

Neither branch can be of any magnitude, for Captain Hannay remarks that at the point of junction with the *Irawadi*, the breadth of the *Shueli* is not more than 300 yards, and that it contained but little water,—a satisfactory proof that, this stream can have no connexion with the *Tsanpo* of *Thibet.*

At *Yebouk yua*, a day's journey above the *Shue khyoung*, two boats passed the party with Chinese in them from *Bamo.* "They work their boats which are of the Burman round-shaped flat-bottomed description, and seem to be of a tolerable size, as there must have been at least twenty men in each. These boats are particularly well adapted for the navigation of the *Irawadi*, as they do not draw more than 18 inches of water."

On the 13th of December the party reached *Katha*, a town of some extent on the right bank of the river, containing about 400 houses, and a population whose numbers appear to be annually increased by large parties who come from the interior, and take up a temporary abode on the right bank of the river, and on the numerous islands and shoals in its bed, for the purpose of fishing and traffic: at the close of the season they return to their respective homes in time for the resumption of agricultural labour, and a traveller ignorant of this nomade custom, which appears to be very general in the upper part of the *Irawadi*, would form an exaggerated estimate of the population of the towns and villages in which they are thus temporarily congregated. "The bazar of *Katha* was well supplied with good native vegetables of various sorts, fresh and saltfish, pork sold by Chinamen, dried cocoanuts, sugar-cane, and rice from the coarsest to the best quality, the latter selling at 15 ticals a hundred baskets." Captain Hannay also saw a small quantity of stick lac in the bazar, but it was dear, and of a description very inferior, to that which is procurable at *Rangun*, and is brought from the Shan territory east of *Ava.* Even at this remote spot there was a 'tolerable display' of British piece goods, but not nearly to the extent noticed at *Kyundoung.* Captain Hannay mentions a *Kyoung* or monastery recently erected by the Myothagi of *Katha*, as one of the most remarkable objects of the place. "It is a large wooden building covered with beautiful carved work, and situated near the river. The grounds surrounding it are extensive, and very tastefully laid out with fruit trees and flowery shrubs, amongst which I saw the Chinese rose in great plenty." The river is here confined by lofty banks not more than two furlongs apart, but the stream is very deep, and the spot appears to be a particularly favorable one for obtaining a good section of the river, the velocity

of which at *Wegyih*, a village above *Katha*, Captain Hannay estimated at one mile and a half an hour, with an average depth of 18 feet. This would give a discharge of about 52,272 cubic feet per second, while that of the *Ganges* at the same season may be assumed on Rennell's authority at 80,000 feet per second, giving for both a proportion of 1 to 1.53. No satisfactory comparison can, however, be yet instituted between these magnificent rivers, for up to the present moment we are without a single section of the *Irawadi*, which could be safely assumed as the basis of a calculation sufficiently accurate for such a purpose.

At *Kyouk-gyih*, which the party reached on the 17th, they had fairly entered the remarkable curve in the *Irawadi* which had been previously represented in all our sketches of the river, and served, in the absence of more accurate information, as a point of reference, generally well known to the Burmahs and Shans. Here there is a ledge of rocks, over which the stream passes with so great a degree of rapidity, as to render it very difficult of navigation during the rains. The rocks are serpentine and the sand collected amongst them appeared to be a mixture of small garnets and iron sand The right bank of the river, for two miles below *Kyouk-gyih*, is composed of small round stones and sand, and Captain Hannay was told that the natives wash the soil for gold.

No circumstance throughout this voyage afforded a more gratifying proof of the friendly feeling generally of the Burmese authorities, than the attentions which Captain Hannay received at every place at which they halted. Houses were erected for his accommodation at the various stages of the route, differing in no respect from those intended for the Myuwun of *Mogaung*; presents of fruit, rice, and vegetables were daily made to himself and followers, and the supposed tedium of his evenings was relieved by a band of singers and dancers, who are found at almost every town and village in the Burman empire. At *Kyouk-gyih*, these attentions were shewn to a very remarkable degree by the Woon of *Munyen*, "whose civility," says Captain Hannay, "was the subject of conversation with every one in the fleet."

"Every individual has received sufficient rice and fish for two days' supply, and my boat was filled by him with all sorts of provisions, enough certainly to last myself and my followers for a week." The house of this liberal Woon, Captain Hannay describes "as a very neat and comfortable dwelling, with a remarkably clean compound, in which there is a garden laid out with a great deal of taste, and, besides

many articles of costly Burman household furniture, he has a number of very fine muskets and other arms." The party had now approached within a comparatively short distance of *Bamo*, and the vicinity of this celebrated mart was shewn, in more numerous villages than had been seen for several preceding days. From *Shuegu Myu* to *Balet*, a distance of three miles, the houses appeared to extend in an uninterrupted line, and *Kywun-do*, the name of a celebrated island in the river, covered with 100 pagodas, is most conveniently situated between these towns, the inhabitants of which hold their principal festivals upon it, at particular seasons of the year.

Near this spot, is the entrance to the second *kyouk-dwen*, the scenery of which appears to be very magnificent, and is thus described by Captain Hannay. "The river passes directly through the hills, which rise perpendicularly on both sides to the height of 400 feet; they are rocky, and of irregular and singular forms, having at the same time a sufficient number of trees on them to render the scenery very striking. One part of the range, on the right bank, rises as perpendicularly as a wall to the height of 500 feet, forming a grand and terrific precipice. This *kyouk-dwen* extends for four miles, and the hills which form it, are throughout of a rocky nature. The upper part of them appeared to be sandstone, resting on a base of blue-coloured limestone, mixed with veins of beautiful white marble; and at one spot I saw large masses of compact and foliated primitive limestone, along with calcarious spar in large pieces."

Koung-toun, which the mission reached on the 20th, is said to contain about 200 houses, and is noted for the defence made by its Burmese garrison, against a large invading force of Chinese during the last war between these two nations. A ditch surrounds the town, and the remains of a brick redoubt, loop-holed for arrows or musquetry are still perceptible encircling a pagoda. "This is now all that is to be seen," adds Captain Hannay, "of the old fortification, but the town is still surrounded by a double palisade of bambus with sharp stakes placed between them." These defences are intended for the protection of the inhabitants against the Kakhyens, a tribe occupying the hills to the east, who frequently come down in small bodies for the purpose of carrying off cattle. Captain Hannay saw a great number of this tribe at *Koung-toun*, where they barter their rice and cotton for salt and *gnapee* (potted fish), and describes them, with few exceptions, as perfect savages in their appearance; their cast of countenance forms a singular exception to the general rule, for it is not at all Tartar in its

shape, but they have, on the contrary, "long faces and straight noses, with a very disagreeable expression about the eyes, which was rendered still more so by their lanky black hair being brought over the forehead so as entirely to cover it, and then cut straight across on a line with the eyebrows. These people, though surrounded by Shans, Burmese and Chinese, are so totally different from either, that it is difficult to imagine from whence they have had their origin."

On the 20th of December the fleet moored at a village about five miles below *Bamo,* which being a town of great importance, and the residence of an officer inferior in rank to the *Mogaung* Woon, some previous arrangements were necessary to enable the latter to land with the eclât due to his rank. On reaching the town late on the following day, they found the left bank on which it stands so precipitous, that they were compelled to cross to the opposite side of the river, and a feeling of jealousy having arisen between the two Woons of *Mogoung* and *Bamo,* the former resumed his journey on the 22d, which compelled Captain HANNAY to defer the inquiries he was so anxious to make until his return in April, when he found the people far more communicative than they had ventured to be in the presence of the *Mogaung* Woon. The information obtained on both occasions will be more advantageously shewn in a connected form than in the detached portions in which it necessarily appears in his journal, and Captain HANNAY's first remark solves a difficulty, which, like the Adria of ancient history, has proved a stumbling block to modern investigation. In the course of inquiry into the sites of the principal towns on the *Irawadi* river, that of *Bamo* naturally held a very prominent place, and some of the native Shans, who were questioned on the subject affirmed that it was on the bank of the *Irawadi* river, while others, whose opportunities of acquiring information had been equally good, positively denied this statement, and fixed its position on the left bank of a small stream which flows into the *Irawadi,* about a mile above the present town. Captain HANNAY reconciles the conflicting statements, briefly but satisfactorily, in the following remark:—

"I find that this is a *modern* town erected on the banks of the *Irawadi,* for the convenience of water-carriage between it and *Ava.* The *old* Shan town of *Manmo,* or *Bamo,* is situated two days journey up the *Tapan* river, which falls into the *Irawadi* about a mile above the new town of *Bamo* or *Zee-theet-zeit,* or new mart landing-place."

"This modern town," says Captain HANNAY, "is situated on high unequal ground, and the bank towards the river is from 40 to 50 feet

in height, and composed of clay. With the exception of *Ava* and *Rangun* it is the largest place I have seen in Burmah, and, not excepting these places, I certainly think it the most interesting. The novelty of so large a fleet as ours passing up (and no doubt, having heard that a European officer was of the party) had attracted a great crowd of people to the river side, and on landing, I felt as if I were almost in a civilized land again, when I found myself amongst fair complexioned people, wearing jackets and trowsers, after being accustomed to the harsh features and party-colored dress of the Burmans. The people I saw were Chinese from the province of *Yunan*, and Shans from the Shan provinces subject to *China*. *Bamo* is said to contain 1500 houses, but including several villages which join it, I should say it contained 2000 at least, 200 of which are inhabited by Chinese. Besides the permanent population of *Bamo*, there are always a great number of strangers there, Chinese, Shans, and Kakhyens, who either come to make purchases or to be hired as workmen. There are also a great number of Assamese both in the town and in the villages immediately connected with it, amongst whom are several members of the *Tapan* or *Assam* Raja's family. *Bamo* is the jaghire of the *Tapan* Raja's sister, who is one of the ladies of the king of *Ava*.

" The inhabitants of this district live in large comfortable houses, which are thatched with grass, and walls made of reeds. They are generally railed in, and all the villages have bambu palisades surrounding them. The Palongs of the Chinese frontier are, I am told, remarkably industrious. They are good dyers, carpenters and blacksmiths, and all the *dhas* or swords used in this part of the country are made by them." " I received," adds Captain Hannay, " great attention from the Myuwun of *Bamo*, and also from the head Chinese there; they sent me tea, sugar, dried fruits, and vegetables, for which I, of course, made a suitable return. The annual caravan from *China* had not arrived, and the supply of Chinese articles in the shops was very small."

The people of *Bamo* were so strongly impressed with the idea that Captain Hannay's only object was to find a road by which British troops might penetrate to *China*, that he found it extremely difficult to obtain any information from them regarding the routes into that country. The Chinese themselves, however, proved more communicative, and from them he learnt the existence of several passes from *Bamo* into *Yunan*; but as one of these presents far greater facilities of transit than the others, it is generally adopted for commercial intercourse, and the mode of carrying it on is thus described. " At

the distance of two miles* above *Bamo* the mouth of the *Taping* or *Tapan* river is situated. This river has a direction N. 70 E. for about two days' journey, when it cuts through the Kakhyen range, and under these hills, old *Bamo,* or *Manmo,* is situated. To the latter place the Chinese take their merchandise from modern *Bamo* by water, and then proceed overland to the choki or *ken* of *Loailong* near *Mowan,* which they reach in three days, and from thence to *Mounyen* or *Tengyechew* in the province of *Yunan,* at which place they arrive in eight or nine days. The road from *Bamo* to *Loailong* is through the hills, which are inhabited by Kakhyens and Palongs, after which it passes through the country of the Shans, called by the Burmans, *Kopyi-doung.* The road is described as being very good, and quite a thoroughfare. The *Tapan Khyoung* is not navigable for large boats, in consequence of which the Chinese use two canoes tied together, with a platform over them, for the transport of their merchandise to *Manmo* or old *Bamo,* and for the remainder of the journey it is carried on ponies or mules."

This description of the size of the *Tapan Khyoung,* which is also called by the Shans *Numtaping,* completely sets at rest the keenly agitated question of its identity with the *Tsanpo* of *Thibet,* and the theory of KLAPROTH (who, on the authority of Chinese writers, calls it the *Pinglankhyoung,* and maintains it to be the prolongation of the *Tsanpo),* is shown to have no better foundation than his unauthorized change in the position assigned to the latter river, in that part of its course which passes through *Thibet.* Captain HANNAY describes the *Taping* as not more than 150 yards broad, and with only sufficient water to float a small boat. The Singphos affirm that it is a branch of the *Shueli Khyoung* (the *Lungshue kiang* of the Chinese) from which it separates above *Momein,* but the accuracy of this report appears highly questionable.

The principal article of trade, which is cotton, is entirely in the hands of the Chinese, who arrive at *Bamo* in the months of December and January. The greater part of their imports is taken to *Ava,* as neither the natives of *Mogaung* nor *Bamo* could afford to purchase them. "What they dispose of here," says Captain HANNAY, "are copper pots, carpets and warm jackets." These articles are also taken all over the Burman territories, as far west as the *Khyendwen.* There are several cotton godowns here, belonging to the Chinese, and there are constantly residing in the town 500 of these people, which,

* In another place it is mentioned as only one mile above *Bamo.*

with the numerous arrivals from different parts of the country, gives the place a very business-like appearance, and there is of course a good bazar." There is a very neat temple built by the Chinese of *Bamo*, which Captain Hannay visited, and was most politely received by the officiating priest. "On entering his house," says Captain Hannay, "he rose to meet me, saluted me in the English fashion, asked me to sit down, and ordered his people to bring me tea; after which he sent a person with me to shew me the curiosities of the temple. Most of the figures were carved on wood, and different from what I have generally seen in Chinese temples; one of them represented the *Nursinga* of the Hindus. The Chinese of *Bamo*, although different from the maritime Chinese, in language and features, have still the same idea of neatness and comfort, and their manners and mode of living appear to be much the same."

"Their temple and all the houses, which are not temporary, are substantially built of bricks stained blue; the streets are paved with the same material, and the grounds of the temple are surrounded by a neat brick wall covered with tiles." "Besides the trade carried on at *Bamo* by the Chinese, the Shans, Palongs, and Singphos under *China*, are great purchasers of salt, *gnapee*, dried fish, and rice, but particularly salt, which is in constant demand; and to procure it, numbers of the above named people come to *Bamo*, *Sambaungya* and *Kountoung*. The salt which sells here for twenty ticals of silver for 100 vis, or 28 rupees for 150 seers, is brought principally from *Sheinmaga* above *Ava*, and from *Manbu*, which is situated two marches west of *Katha*. The Shans here are distinguished by their fair complexions and broad good-tempered faces. They wear turbans and trowsers of light blue cotton cloth; they greatly resemble the Chinese, and from living so near that nation, many of them speak the *Yunan*-Chinese language. They inhabit the country to the east of *Bamo*, and their principal towns are *Hotha*, *Latha*, *Santa*, *Sanla*, *Moongsye*, *Moong-woon*, *Moong-man*, *Moong-la*, and *Moong-tye*. The people are generally designated Shan Taroup or Chinese Shans."

"Although the Palongs speak the Shan, their own native language is a distinct one. The men, though small in stature, are athletic and remarkably well made. Flat noses and grey eyes are very common amongst them. They wear their hair tied in a knot on the right side of the head, and dress in a turban, jacket, and trowsers, of dark blue cloth. They are a hill people, and live in the tract of country situated between *Burmah* and *China*, but those to the east of *Bamo* pay no revenue to either country, and are governed by their own

Tsobuas. The Singpho traders I saw at *Bamo* were very different from those under *Burmah,* and according to their proximity to either Shans or Chinese, they assimilate to one or other in dress and language."

"The whole of these people," says Captain Hannay, "pay for every thing they require in silver; and were it not for the restrictions in *Burmah* on the exportation of silver, I think an intelligent British merchant would find it very profitable to settle at *Bamo*; as, besides the easy intercourse with *China,* it is surrounded by numerous and industrious tribes, who would, no doubt, soon acquire a taste for British manufactures, which are at present quite unknown to them." The revenue of the district is estimated by Captain Hannay at three lakhs of rupees per annum; and he adds, "If appearance of comfort may be taken as a proof of its prosperity, the inhabitants of *Bamo* shew it in their dress and houses. I have seen more gold and silver ornaments worn here than in any town in *Burmah.*"

On leaving *Bamo,* the appearance of the country became much more hilly, and great precautions were taken to guard against surprise by the Kakhyens, who inhabited the different ranges in the vicinity of the river.

At *Hakan* the escort was reinforced by 150 soldiers from *Bamo,* and a number of families who were proceeding up the river, joined the fleet to enjoy the protection afforded by so large a convoy. The Shans who composed the quota from *Bamo* were a remarkably fine set of men from the banks of the *Tapan Khyoung,* and formed a striking contrast, in dress and appearance, to the miserable escort which had accompanied the party from *Ava.*

At the village of *Thaphan-beng* they entered the third *Kyouk-dwen* from which a very beautiful view is obtained of the fertile valley of *Bamo,* bounded on the east by the Kakhyen hills, which are cultivated to their summits. Serpentine and limestone were the principal rocks found in this defile, as well as the preceding one; and as the river was here in some places not more than 80 yards broad, with a depth of 30 feet, and its rise is in the rains 50 feet above the present level, the rush of waters must at that season be terrific. The natives, indeed, declared, that the roar at that time was so great, as to prevent them from hearing each other speak, and that the defile could only then be traversed on rafts: now, however, it coursed gently along with an almost imperceptible motion.

At *Thabyebeng-yua* they found a new race of people called Phwons, who described themselves as having originally come from a country

to the north-east, called *Motoung Maolong*, the precise situation of which could not be ascertained. Their native language, which they speak only in intercourse with each other, differs altogether from the Shan and Burmese, but they have no written character. There appear to be two tribes of this race, distinguished by the Burmahs as the great and small:—The former are found only at *Tshenbo* and in the vicinity of the third *Kyouk-dwen*, while the inferior tribe is scattered all over the country: the only difference apparently between them consists in some trifling varieties in the dialects they speak. Their extensive cultivation proved their agricultural industry, and four Chinese Shans were constantly employed in manufacturing their implements of husbandry. Their houses were of a construction totally different from any that had been previously seen, and consisted of a long thatched roof rounded at the ends and reaching almost to the ground. Inside of this and at the height of eight or ten feet from the ground, the different apartments are formed, the walls of which are made of mat.

"From the outward appearance of these houses," says Captain Hannay, "it would be difficult to imagine that they were habitations, but inside they are very comfortable, and from the great thickness and peculiar form of the roof, the inmates cannot be much affected either by heat or cold." The same description of house is built by the Shans occupying the valley of *Kubo*, and it is probable that the Phwons have adopted this style of building from some tribe of that widely scattered nation.

On the 26th the fleet reached a part of the *Irawadi*, which is considered the most dangerous point in its navigation. It is called *Pusku*, and the stream is there confined to a breadth of 30 yards, but with no less than nine fathoms of depth in the centre. The rocks bore every appearance of fierce and irregular volcanic action, varying in color "from brown, yellow, red and green, to a jet black which shone like a looking glass." The strata also presented a scene of great confusion, some being vertical, some horizontal, and others twisted; "the whole having exactly the appearance of having been poured out from a furnace."

The navigation of the *Irawadi* river up to this point had been unmarked by difficulties of any magnitude, and, with the exception of the passes through the *Kyouk-dwens*, the channel appears to have afforded, even at that season of the year, an abundant supply of water for the largest class of boats, which ply between *Ava* and *Bamo:* above the village of *Namhet*, however, they first met a succession of rapids ex-

tending for a mile and a half, which were even then considered dangerous; and Captain Hannay remarks, that he had seldom seen in the worst season, and worst part of the *Ganges*, a stronger current, or more turbulent water than at the rapids of *Shuegyain-man*, a short distance above the village of *Namhet*.

On the arrival of the fleet at *Tshenbo*, which is about 10 miles below the mouth of the *Mogaung* river, the boats by which the party had been conveyed from *Ava* were exchanged for others of a smaller description, better adapted for the navigation of so small and tortuous a river as that of *Mogaung*. The one prepared for Captain Hannay's accommodation was of the kind called by the Burmese " *loung*:" it was paddled by 25 men, and formed of a single tree, with the addition of a plank 10 inches broad, all round the upper part of it.

Before quitting *Tshenbo*, Captain Hannay had a visit from the head priest, whose curiosity to obtain some knowledge of European customs and habits could only be satisfied by the display of the contents of his trunks, and the sight of his watch, sextant, and thermometer; all of which he was permitted to examine by Captain Hannay, who regrets that he had not brought some missionary tracts with him from *Ava* "to give this inquisitive priest some idea of the Christian religion." *Tshenbo*, on the authority of this priest, is said to have been formerly a principal city of the Phwon tribe, who were dispossessed of it, about sixty years ago, by the Burmahs.

On the last day of December the mission reached the mouth of the *Mogaung* river, which Captain Hannay ascertained by observation to be in latitude 24° 56′ 53″. Here they were to quit the *Irawadi*, which, says Captain Hannay " is still a fine river flowing in a reach from the eastward half a mile broad, at the rate of two miles an hour, and with a depth varying from three fathoms in the centre to two at the edge."

The *Mogaung* river on which the town of the same name is situated, is not more than 100 yards wide, and the navigation is impeded by a succession of rapids over which the stream rushes with considerable velocity. The smallest boat in the fleet was an hour and a half getting over the first of these obstacles, and the Shan boatmen, who are thoroughly acquainted with the character of the river, "pull their boats close to the rocky points, and then, using all their strength, shoot across to the opposite side before the force of the stream had time to throw them on the rocks." The Burmah boatmen adopted the apparently easier method of pulling their boats up along the edge of the stream, but this proved both difficult and dangerous, one boat being upset and a man drowned. The banks of the river were covered with a dense and impervious jun-

gle, which extended nearly the whole way to *Mogaung*, and no village served to beguile the wearisome monotony of this portion of the journey, until they reached *Akouktoung*, a small hamlet on the right bank inhabited by Phwons and Shans. Here they met a chief of the *Laphae* Singphos, who had taken up his residence in this village with a few followers, in consequence of a feud with some neighbouring tribes in his own country to the north. Between *Akouk-yua* and *Tapoh* (the next village seen) the bed of the river is filled with rocks and rapids, which render the navigation exceedingly dangerous, the stream shooting over them with such velocity as frequently to rise above the bow of the boat, which, in case of unskilful management, would be instantly upset. The way in which the Phwons and Shans overcome these difficulties, formed a striking contrast to the conduct of the Burmah and Kathay boatmen. The former working together with life and spirit, still paid the strictest attention to the orders given by the head boatman ; while the latter " who think," says Captain Hannay, " that nothing can be done without noise, obey no one, as they all talk at once, and use the most abusive language to each other." He thinks the Phwons and Shans greatly superior to the Burmahs or Kathays,—meaning by the latter those Manipuris resident in *Ava*, who are Burmans in every thing but origin.

After passing the last rapids at *Tapoh* the river expands in breadth to 200 yards; the stream flows with a gentle current, and " the bed is composed of round stones which are mostly quartz. Amongst them, however, there are found massive pieces of pure crystal stone, partaking of the nature of talc, and also pieces of indurated clay of different colours. The banks are alluvial on the surface, but towards the base and near the edge of the river the soil becomes gravelly, and in some places has a stratum of beautiful bright yellow-coloured clay intersecting it."

On the 5th of January the party disembarked from their boats, and as the Myo-wun was to be installed in his new government, the landing was effected with considerable state. " Arrangements," says Capt. Hannay, " had been made for our reception, and on first landing we entered a temporary house where some religious ceremony was performed, part of which was the Myo-wun supplicating the spirits of three brothers who are buried here, and who founded the Shan provinces of *Khanti*, *Assam*, and *Mogaung*, to preserve him from all evil. After which ceremony he dressed himself in his robe of state, and he and I proceeded hand in hand through a street of Burman soldiers, who were posted from the landing place to the Myo-wun's house, a

distance of nearly a mile: we were preceded by the Myo-wun's people carrying spears, gilt chattas, &c. and at intervals during our walk, a man in a very tolerable voice, chaunted our praises, and the cause of our coming to *Mogaung*. Several women also joined the procession, carrying offerings of flowers and giving us their good wishes."

The Myo-wun appears to have lost no time in availing himself of the advantages of his situation, for on the very day after landing, he commenced a system of unsparing taxation, to enable him to pay for his appointment. A rapid succession of governors within a very few years, all influenced by the same principle, had already reduced the inhabitants of *Mogaung* to a state closely bordering on extreme poverty, and the distress occasioned by the exactions now practised was bitterly complained of by the wretched victims of such heartless extortion. The Shan inhabitants of the town were employed by the Burmese officers to enforce this excessive payment of tribute from the Singphos and Kakhyens of the surrounding hills, which had led to much ill-will on the part of the latter, by whom they are stigmatised "as the dogs of the Burmans."

"The town of *Mogaung*," says Captain Hannay, "is situated at the junction of the *Namyeen* or *Namyang*, and the *Mogaung* or *Numkong* rivers, and extends about a mile from east to west along the bank of the last named river, the west end of the town being bounded by the *Namyeen khyoung*, which comes from the district of *Monyeen* in a direction S. 43 W. The town of *Mogaung*, strictly speaking, is confined within what is now only the remains of a timber stockade. Outside of this, however, there are several houses, and within a short distance a few small villages are scattered about, but even including all these, there are not more than 300 houses. Those within the stockade are inhabited by Shans, and those outside by Burmans, Phwons, Assamese and a few Chinese. The latter to the number of fifty reside here, and are under the authority of a Thoogyee of their own nation;—they derive a profit from their countrymen who come annually in considerable numbers to purchase serpentine. Amongst them I saw both blacksmiths and carpenters, and, for the first time since leaving Gangetic India, I saw the operation performed of shoeing horses. The Shans, inside the stockade, reside in large houses, such as I formerly described having seen amongst the Phwons;—the Burmans and others live in the same description of houses as are to be seen in every part of *Burmah proper*, but all bear signs of great poverty; and if it were not for the Chinese, whose quarter of the town looks business-like and comfortable, I should say

that *Mogaung* is decidedly the poorest-looking town I have seen since leaving *Ava*. There is no regular bazar, all supplies being brought from a distance, and the market people are, with few exceptions, Kakhyens and Assamese from the neighbouring villages."

The arrival at so remote a spot of a European officer was soon bruited abroad, and Captain Hannay's time was fully occupied in answering innumerable questions put to him by a crowd of visitors, who examined his sextant with great care, under the firm conviction that, by looking through it, he was enabled to perceive what was going on in distant countries;—nor would they believe that the card of his compass was not floating on water, until, to satisfy them, he had taken it to pieces. The paucity of inhabitants and poverty of the town plainly indicated the absence of extensive trade, and Captain Hannay learnt, that, including the profits derived from the sale of serpentine, the revenues of the town and neighbouring villages did not amount to more than 30,000 rupees per annum, and the Burmah authorities can only enforce the payment of tribute from the Shans of *Khanti*, and the Singphos of *Payendwen*, by the presence of an armed force. In their last attempt on the latter, a Burmah force of 1000 men was detached from *Mogaung*, of whom 900 were destroyed; and for ten years they had been held in salutary dread by the Burmah governors of the frontier. During his stay at *Mogaung*, Captain Hannay obtained specimens of the green stone, called by the Burmahs *kyouk-tsein*, and by the Chinese *yueesh*,* and which he supposes to be nephrite. "The Chinese," he says, "choose pieces which, although showing a rough and dingy-coloured exterior, have a considerable interior lustre, and very often contain spots and veins of a beautiful bright apple-green. These are carefully cut out, and made into ring stones, and other ornaments, which are worn as charms. The large masses are manufactured by them into bracelets, rings, and drinking cups, the latter being much in use amongst them, from the idea that the stone possesses medicinal virtues. All the *yueesh* taken away by the Chinese is brought from a spot five marches to the north-west of *Mogaung*, but it is found in several other parts of the country, although of an inferior quality. Serpentine and lime-

* Monsieur Abel Re'musat, in the second part of his history of *Khotan*, is said by Klaproth (Mem. Rel. à l' Asié, tome 2, p. 299) to have entered into a very learned disquisition proving the identity of the *yu* or *yueesh* of the Chinese with the *jasper* of the ancients.—R. B. P.

The *yu* is a silicious mineral, coloured with less intensity but passing into heliotrope. It is therefore *prase* rather than *jade* or nephrite.—Ed.

stone are the prevailing formations of the base of the highest ranges of hills throughout this part of the country. Steatite is also abundant in the bed of the *Irawadi* below the valley of *Khanti*."

One very important object of Captain HANNAY's mission was to cross the *Patkoi* mountains into *Assam*, and on his arrival at *Mogaung* he waited some days in considerable anxiety for the *Kakhyen* porters, who were to convey his baggage and supplies during the remaining portion of the journey :—he soon found, however, that the authority of the Burmans when unenforced by the presence of a large military detachment, was held in the most sovereign contempt by these hardy mountaineers, and after many fruitless attempts to induce the *Mogaung* woun to allow him to proceed with even a small party, he was constrained to limit his further researches to the *Hukong* valley and amber mines. Repeated remonstrances were necessary to induce the governor to proceed even so far, and it was not until the 19th of the month that an advanced guard crossed the river, and fired a feu de joie, after performing the ceremony of sacrificing a buffalo to the Nhatgyee (or spirits of the three brother Tsaubuas of *Mogaung*), without which no expedition ever marches from the town. Even then, the dogged obstinacy of the governor induced him to delay his departure, and it was not until Captain HANNAY threatened that he would instantly return to *Ava* if there were any longer delay, that the wily diplomatist could be induced to move.

On the 22d they crossed the river, and the camp was formed on the northern bank, in strict accordance with Burmese custom. Captain HANNAY's tent (a common sepoy's pál) was the admiration of every one but its owner, who now for the first time marched with an undisciplined rabble. "The soldiers' huts," says Captain HANNAY, "are composed of branches of trees and grass, and if they wish to be particular, they cover them with a piece of cloth, which is generally some old article of dress. The Myo-wun's station is in the centre of the camp, and in front of him are his own immediate followers, whose huts are formed into a street marked by a double line of spears. At the head of this street the flags are placed, and also the two small cannons (one-pounders), which are sent with the force, I believe, for the purpose of firing three rounds morning and evening, to frighten the neighbouring Kakhyens, and which ceremony, I suspect, will be gone through with as much gravity, as if it would have the desired effect. My position is in front and a little to the left of the Myo-wun and we are completely surrounded by the soldiers, whose huts are in distinct lines, the men of each district keeping together."

On the 22d they at length set out, and the style of march was as little in accordance with the military experience of our traveller, as the previous encampment. "The men, to the number of 800, march in single file, and each man occupies a space of six feet, being obliged to carry a bangy containing his provisions, cooking pots, &c. besides his musket, which is tied to the bangy stick. This is the most common mode of marching, but some of them carry their provisions in baskets, which they strap across their forehead and shoulders, leaving their hands free to *carry* their muskets ; but as to *using* them it is out of the question, and I should say the whole party are quite at the mercy of any tribe who choose to make a sudden attack upon them." On reaching the encamping ground, however, these men gave proof how well they were adapted to this mode of travelling, for in an hour after their arrival, every individual had constructed a comfortable hut for himself, and was busily engaged cooking the rice, which, with the addition of a few leaves plucked from certain shrubs in the jungle, forms the diet of the Burman soldier on the line of march.

The tract of country through which the party passed on the first two days was hilly, and abounded in a variety of fine forest trees ; but on approaching *Numpoung*, the second encampment, the country became more open, and the pathway led through a forest of very fine teak trees. The principal rivers all flowed from the *Shuedoung-gyi* range of hills on the east of their route, and are at this season of the year mere mountain torrents, with so little water in them, that the path frequently passes over their rocky beds. The whole route from *Mogaung* to the *Hukong* valley, may be described generally as passing between defiles, bounded by the inferior spurs of the *Shuedoung-gyi* range on the east, and numerous irregular hills on the west; these defiles form the natural channels of numerous streams, which, flowing from the heights above, and struggling amidst masses and boulders of detached rock, make their way eventually to the larger stream of the *Numkong*, which unites with the *Namyen* at *Mogaung*. The only traces of inhabitants perceptible in the greater part of this route were a few cleared spots on the hills in the vicinity of some scattered Kakhyen villages, and a few fishing stakes in the mountain streams. Near the mouth of the *Numsing Khyoung* the party met with a few Kakhyen huts, which appear to have been constructed by that tribe, during their fishing excursions ; and at *Tsadozout*, an island in the bed of the *Mogaung* river, on which the force encamped on the 28th of January, they passed the sites of two Kakhyen villages, and found the ground completely strewed with graves for a considerable distance, the proba-

ble result of some endemic disease which induced the survivors to desert the spot. The finest lemon and citron trees, Captain HANNAY had ever seen, were found here, and the tea plant was also very plentiful—the leaf is large, and resembles that sold in *Ava* as pickled tea; the soil in which it grew most luxuriantly is described as of a "reddish-colored clay." Thus far, a considerable portion of the route had passed either directly over the bed of the *Mogaung* river or along its banks; but at *Tsadozout,* they crossed it for the last time, and at this spot it is described as a mere hill stream with a "bed composed of rolled pieces of sienite and serpentine, with scales of mica in it." The navigation of the river even for small canoes ceases below this spot, and those which had accompanied the party with supplies were left, from inability, to convey them further.

About four miles north of *Tsadozout* "the road ascends about 100 feet, and passes over a hilly tract, which seems to run across from the hills on the east to those on the west, and is called by the natives *Tsambu-toung* (the *Mount Samu* of the maps). This transverse ridge evidently forms the southern limit of the *Hukong* valley, and streams flow from it both to the north and south; the former making their way to the *Khyendwen,* and the latter to the *Mogaung* river.

"*Tsambu-toung,*" says Captain HANNAY, "is covered with noble trees, many of which, I think, are sàl, and are of immense height and circumference. The tea-plant is also plentiful, besides a great variety of shrubs which are quite new to me. The rays of the sun seem never to penetrate to the soil of *Tsambu-toung*; it may therefore be easily imagined how damp and disagreeable it is, more particularly as there is a peculiar and offensive smell from a poisonous plant which grows in great abundance in this jungle, and the natives tell me that cattle die almost immediately after eating it."

On the 30th the party descended from the encampment on the northern face of this ridge, to the Singpho village of *Walobhum,* and finally encamped on the left bank of the *Edikhyoung,* about three furlongs distant from *Meinkhwon* or *Mungkhum,* the capital of the *Hukong* valley, "where," says Captain HANNAY, "our journey must end for the present; as, besides having no provisions, the men composing the force are so completely worn out with fatigue, that I am certain they could not proceed further without a halt of some days." This interval Captain HANNAY assiduously employed in collecting information regarding the valley, which had from a very early period been an object of great geographical interest, as the site of the *Payendwen* or amber mines, and at no very remote era probably formed

the bed of an alpine lake, which, like that of the *Manipur* valley, has been subsequently raised to its present level by long continued alluvial deposits, and detritus, from the hills which encircle it on every side. The tendency of every such deposition is to raise the level of the water, and facilitate its drainage, until it becomes so shallow, that evaporation suffices to complete the process, and render the soil a fit abode for future races of men. The numerous and extensive lakes in the mountainous regions of *Thibet* and *Tartary* are doubtless undergoing a similar change, and no great stretch of imagination is necessary to anticipate the period when they will become the sites of extensive towns and villages, and present a striking contrast to the rugged magnificence and solitary grandeur of the snowy regions which surround them.

"The valley of *Hukony* or *Payendwen*," says Captain Hannay, "is an extensive plain, bounded on all sides by hills; its extent from east to north-west being at least 50 miles, and varying in breadth from 45 to 15 miles, the broadest part being to the east. The hills bounding the valley to the east are a continuation of the *Shuedoung-gyi* range, which is high, commences at *Mogaung*, and seems to run in a direction of N. 15 E." The principal river of the valley is the *Numtunaee* or *Khyendwen*, which flows from the *Shuedoung-gyi* range, and after receiving the contributions of numerous small streams quits the valley at its north-western corner, and again enters the defiles of the hills, beyond which its course is no longer perceptible. On the western side of the valley there are but few villages, and these thinly inhabited, the capital itself containing not more than thirty houses; but the north and eastern sides are said to be very populous, the houses in those quarters being estimated at not less than 3000, nearly all of which are situated on the banks of the *Towang* and *Debee* rivers. All the low hills stretching from the western foot of the *Shuedoung* range were under cultivation, and the population is said to extend across to the banks of the *Irawadi*, in numbers sufficient to enable the Singphos when necessary to assemble a force of nine or ten thousand men.

"With the exception," says Captain Hannay, "of the village of *Meinkhwon*, which has a Shan population, the whole of the inhabitants of the valley are Singphos and their Assamese slaves. Of the former, the larger proportion is composed of the Mrip and Tisan tribes, with a few of the Laphai clan, who are still regarded as strangers by the more ancient colonists, and can hardly be viewed but with hostile feelings, as this tribe have frequently ravaged *Meinkhwon* within the last six years, and were guilty of the still greater atrocity of burning a priest alive in his *kyoung* or monastery.

Formerly, the population was entirely Shan, and previous to the invasion of *Assam* by the Burmese, the town of *Meinkhwon* contained 1500 houses, and was governed by the chief of *Mogaung*. From that period, the exactions of the Burmese officers have led to extensive emigration, and to avoid the oppression to which they were hourly exposed, the Shans have sought an asylum in the remote glens and valleys on the banks of the *Khyendwen*, and the Singphos among the recesses of the mountains at the eastern extremity of the valley. This state of affairs has led to general anarchy, and feuds are constantly arising between the different tribes, which the quarrel of the Beesa and Dupha Gaums has greatly contributed to exasperate. No circumstance is more likely to check these feuds, and reclaim the scattered population of the valley, than the establishment of a profitable commercial intercourse with the more equitably governed valley of *Assam*, with which communication is now becoming more intimate than at any previous period.

Of the mineral productions of the *Hukong* valley, enumerated by Captain HANNAY, the principal are salt, gold, and amber: the former, he informs us, is procured "both on the north and south sides of the valley, and the waters of the *Namtwonkok* and *Edi* rivers are quite brackish from the numerous salt springs in their beds. Gold is found in most of the rivers, both in grains and in pieces the size of a large pea. The rivers which produce it in greatest quantity and of the best quality are the *Kapdúp* and the *Namkwùn*: the sand of the former is not worked for this mineral, I am told, but large pits are dug on its banks, where the gold is found, as above mentioned. Besides the amber, which is found in the Payen-toung, or amber mine hills, there is another place on the east side of the valley called *Kotah-bhum*, where it exists in great quantities, but I am informed that the spot is considered sacred by the Singphos, who will not allow the amber to be taken away, although it is of an inferior description." Specimens of coal, were also found by Captain HANNAY in the beds of the *Numbhyu* and *Edi* rivers; and he learnt from the natives that, in the *Numtarong*, a great quantity of fossil wood was procurable.

In its relation to *Assam* and *China*, the trade of the *Hukong* valley naturally attracted a share of Captain HANNAY's attention, and from his account it appears that "the only traffic of any consequence carried on in this valley is with the amber, which the Singphos sell to a few Chinese, Chinese-Shans, and Chinese Singphos, who find their way here annually. The price of the common or mixed amber is $2\frac{1}{2}$ ticals a vis or four rupees per one and a half seer: but the best kind and what

is fit for ornaments, is expensive, varying in price according to its colour and transparency*."

"The Chinese sometimes pay in silver for the amber, but they also bring with them warm jackets, carpets, straw hats, copper pots, and opium, which they give in exchange for it. They also barter their merchandize for ivory and gold dust, but only in small quantities. A few individuals from the Burman territories likewise come here, with cloths of their own manufacture, and also a small quantity of British piece goods for sale. But as they are obliged on their way hither to pass through the country of the most uncivilized of the Kakhyen tribes, they seldom venture to come. The greatest part therefore of British and Burman manufactures which are used in this valley, are brought from *Mogaung* by Singpho merchants. But I understand that within the last few years, several of them have gone to *Assam* with gold dust, ivory, and a little silver, for which they receive in return muskets, cloths, spirits, and opium. The following is a list of British piece goods now selling at *Meinkhwon*—common book-muslin used as head dresses, 14 rupees a piece; coarse broad cloth worn as shawls, $2\frac{1}{2}$ yards long, 18 rupees each; good cotton handkerchiefs, 4 rupees a pair; and coarse ones, $2\frac{1}{2}$ rupees a pair. These are the prices of goods bought at *Ava*, but what similar articles from *Assam* may cost, I cannot ascertain. The broad cloth, however, that I have seen from the latter place is of a very superior quality. The merchants who come to this valley from the Burman territories are natives of *Yo*, and the man who is now selling goods here has frequently visited *Calcutta*. The dress worn by the *Singphos* of this valley is similar to that of the Shans and Burmans of *Mogaung*, but they frequently wear jackets of red camlet, or different velvets which they ornament with buttons, and those who can afford it wear a broad-cloth shawl. The arms in common use amongst them are the *dhu* (or short sword) and spear. The women wear neat jackets of dark coarse cotton cloth, and their *thamines* or petticoats are full and fastened round the waist with a band, being altogether a much more modest dress than that worn by the Burman women. Those who are married, wear their hair tied on the crown of the head like the men, but the younger ones wear theirs tied close to the back of the neck, and fastened with silver pins—both married and single wear white muslin turbans. The ornaments generally worn by them are amber ear-rings, silver bracelets, and necklaces of beads, a good deal

* Specimens in matrice are deposited in the Society's Museum,—ED.

resembling coral, but of a yellowish colour, and these are so much prized by them that they sell here for their weight in gold."

During his stay at *Hukong*, Captain HANNAY was visited by many Singphos from the borders of *China*, from whom he learnt that the *Sginmaekha* river rises in the mountains bounding the plain of *Khanti* to the north, and is inclosed on the east by the *Goulang-sigong* mountains, which they consider the boundary between *Burmah* and *China*. This river is, on the same authority, pronounced not to be navig able even for canoes, and the most satisfactory confirmation is afforded of the accounts of Captain WILCOX*. Several smaller streams fall into the *Sginmaekha* from the *Shuedoung-gyi* hills on the west, and the name of *Situng* is given to the tract of country through which they flow. In this district gold is very plentiful, and it is found, says Captain HANNAY, " over the whole tract of mountainous country, above the *Sginmaekha*. The Chinese visit this locality for the purpose of procuring the gold, and give in exchange for it, warm clothing, carpets and opium."

Of the several routes by which communication is kept up between the inhabitants of *Hukong* and the countries around, the principal appear to be, one leading across the *Shuedoung-gyi* range to the eastern Singphos ; a second, called the *Lye-gnep-bhum* road, winds round the base of the mountain of that name, and leads in sixteen days to *Mung-lang*, the capital of the *Khanti* country, which was visited by Captain WILCOX.

The most important one, however, with reference to trade, lies in a south-east direction from the *Hukong* valley, from which the district of *Kakyo-wainmo* is not more than eight days' march distant. By this route the Chinese frequently travel, and it affords a very satisfactory proof that intercourse may be held direct with *China*, without the necessity of following the circuitous route by *Mogaung*.

Among the several races of people inhabiting the valleys through which the principal rivers flow, the Khantis or Khumptis hold a very conspicuous rank: they are represented as a fine, brave, and hardy race of men, and are held in great apprehension by the Burmahs, who, about three years ago, attempted to raise revenue amongst them : the force detached on this duty, however, met with such determined resistance, that it was compelled to return, and no subsequent attempt has

* Although Captain WILCOX (As. Res. vol. xvii. p. 463), relying on the accounts given by Singphos of this river, appears to have formed rather an exaggerated estimate of *its size*, his conjectures as to the position of *its sources* are fully verified by the statements made to Captain HANNAY.—R. B. P.

been made on their independence. They are in constant communication with the Khunungs, a wild tribe inhabiting the mountains to the north and east, from whom they procure silver and iron. "The former is found in a mine, said to be situated on the northern side of the mountains, to the north-east of *Khanti.*" All the information Captain Hannay could obtain led him to suppose that this mine was worked by people subject to *China,* and from the description given, he thinks they are Lamas, or people of *Thibet.* The part of the Chinese territories north-east of *Khanti* is known at *Hukong* by the name of *Mungfan**, and the Khantis have no communication with it but through the Khunungs.

From *Meingkhwon,* Captain Hannay obtained a view of the hill, near which lie the sources of the *Uru* river, one of the principal affluents of the *Ningthi* or *Khyendwen:* it bore south 35° west from *Meingkhwon,* and was about 25 miles distant. It is in the vicinity of this spot that the most celebrated mines of serpentine are situated, and their position is thus described by Captain Hannay.

" A line drawn from *Mogaung* in a direction of N. 55 W. and another from *Meingkhwon* N. 25 W. will give the position of the serpentine mine district. The Chinese frequently proceed to the mines by water for two days' journey up the *Mogaung* river, to a village called *Kam-mein,* at which place a small stream called *Engdau-khyoung,* falls into the *Mogaung* river. From thence a road leads along the *Engdau-khyoung* to a lake several miles in circumference called *Engdau-gyi,* and to the north of this lake eight or nine miles distant are the serpentine mines. The tract of country in which the serpentine is found extending 18 or 20 miles." There is, however, another more direct route from *Kam-mien* which runs in a north-westerly direction. The whole tract of country is hilly, and several hot and salt springs are reported to exist near the *Engdau-gyi* lake, which is said to cover what was once the site of a large Shan town called *Tumansye.* The natives affirm that it was destroyed by an earthquake, and from the description given of a hill in the vicinity, the catastrophe may have been produced by the immediate agency of volcanic action.

On the 21st of March, Captain Hannay visited the amber mines,

* In the second volume of Du Halde's " China," p. 385, the Père Regis thus describes the tribe by which this tract of country is inhabited, and its geographical site :

" The most powerful among the Tartar Lamas are those called by the Chinese *Moong-fan,* who possess a wide territory in *Tibet,* north of *Li Kyang-lu-fu,* between the rivers *Kincha-kyang* and *Vu-lyangho.* This country was ceded to them by Usanghey (whom the Manchews made king of *Yunan*) to engage them in his interest."—R. B. P.

and his description is the first that has ever been given of the locality from whence the Burmans obtain this mineral.

" We set out at eight o'clock," he says, " in the morning, and returned at two P. M. To the foot of the hills the direction is about south 25 west, and the distance three miles, the last mile being through a thick grass jungle, after which there is an ascent of one hundred feet, where there is a sort of temple, at which the natives, on visiting the mines, make offerings to the ngats or spirits. About a hundred yards from this place, the marks of pits, where amber had been formerly dug for, are visible, but this side of the hill is now deserted, and we proceeded three miles further on to the place where the people are now employed in digging, and where the amber is most plentiful. The last three miles of our road led through a dense small tree jungle, and the pits and holes were so numerous that it was with difficulty we got on. The whole tract is a succession of small hillocks, the highest of which rise abruptly to the height of fifty feet, and amongst various shrubs which cover these hillocks the tea plant is very plentiful. The soil throughout is a reddish and yellow coloured clay, and the earth in those pits, which had been for sometime exposed to the air, had a smell of coal tar; whilst in those which had been recently opened, the soil had a fine aromatic smell. The pits vary from six to fifteen feet in depth, being, generally speaking, three feet square, and the soil is so stiff that it does not require propping up."

" I have no doubt," Captain HANNAY adds, " that my being accompanied by several Burmese officers, caused the people to secrete all the good amber they had found. For although they were at work in ten pits, I did not see a piece of amber worth having. The people employed in digging were a few Singphos from the borders of *China* and of this valley. On making inquiry regarding the cause of the alleged scarcity of amber, I was told that, want of people to dig for it was the principal cause; but I should think the inefficiency of the tools they use was the most plausible reason:—their only implements being a bambu sharpened at one end, and a small wooden shovel."

" The most favorable spots for digging are on such spaces on the sides of the small hillocks as are free from jungle, and I am told that the deeper the pits are dug, the finer the amber; and that that kind which is of a bright pale yellow, is only got at the depth of forty feet under ground."

A few days subsequent to this examination of the amber mines, Captain HANNAY visited the *Numtunaee* or *Khyendwen*, which flows through the valley about five miles north of *Meingkhwon* in this part

of its course; and at this season of the year the stream, as might have been anticipated, is small, but in the rains Captain Hannay estimates that its breadth must be 300 yards from bank to bank, and it is navigable throughout the year for large canoes. An island in the centre of the bed was covered with the skeletons of large fish, which had been destroyed by the poisonous quality of the fallen leaves of overhanging trees:—the natives eat the fish so killed with impunity.

After waiting several days at *Meingkhwon*, in anticipation of the return of some messengers who had been sent into *Assam*, and suffering extreme inconvenience from the difficulty of procuring adequate supplies for the force, the Myo-wun began seriously to think of returning to *Mogaung*. All expectation of prosecuting the journey into *Assam* had been relinquished, and the Dupha Gaum having voluntarily come into the camp, was received by the Burman governor with a civility and distinction, extorted by his apprehension of the numerous Singphos ready to support their redoubtable chieftain, whose influence is said to extend to the frontiers of *China*. On the first of April the ceremony was performed of swearing in the different Tsobuas (tributary chiefs) to keep the peace, which is thus described by Captain Hannay.

"The ceremony commenced by killing a buffalo, which was effected with several strokes of a mallet, and the flesh of the animal was cut up to be cooked for the occasion. Each Tsobua then presented his sword and spear to the spirits of the three brother Tsobuas of *Mogaung*, who are supposed to accompany the governor of the above named place, and to inhabit three small huts which are erected on the edge of the camp. Offerings of rice, meat, &c. were made to these *ngats* or spirits, and on this being done, each person concerned in taking the oath received a small portion of rice in his hand; and in a kneeling posture, with his hands clasped above his head, heard the oaths read both in the Shan and Burmese languages. After this, the paper on which the oaths were written was burned to ashes, and mixed with water, when a cup full of the mixture was given to each of the Tsobuas to drink, who, before doing so, repeated an assurance that they would keep the oath, and the ceremony was concluded by the chiefs all sitting down together and eating out of the same dish." The chieftains to whom this oath of forbearance was administered were the Thogyee of *Meingkhwon*, a Shan—the Dupha Gaum, a *Tesan* Singpho—the Panwah Tsobua, a *Laphaee* Singpho—the Situngyen Gaum, and Weng-keng-moung, *Mirip* Singphos—and Tare-poung-noung, a *Tesan* Singpho,—all of whom, by this act, virtually acknowledged the supre-

macy of the Burman authorities, and their own subjection to the kingdom of *Ava.*

The new governor having succeeded by threats and the practice of every art of extortion, in raising as large a sum as it was possible to collect from the inhabitants of the valley and surrounding hills, announced his intention of returning to *Mogaung* ; and on the 5th of April no intelligence having been received from *Assam*, Captain Hannay left *Meingkhwon* on his return to *Ava*, with a very favorable impression of the Singphos he had seen, who appear to possess great capabilities of improvement, and whose worst qualities are represented as the natural result of the oppressive system of government under which they live. One of their chieftains in conversation with Captain Hannay furnished a clue to the estimation in which they held the paramount authorities around them by the following remark. " The British," he said, " are honourable, and so are the Chinese. Among the Burmans you might possibly find one in a hundred, who, if well paid, would do justice to those under him. The Shans of *Mogaung*," he added " are the dogs of the Burmans, and the Assamese are worse than either, being the most dangerous back-biting race in existence."

On the 12th of April, Captain Hannay reached *Mogaung*, and some boats arriving shortly afterwards from the serpentine mines, he availed himself of so favorable an opportunity of acquiring some additional information regarding that interesting locality. He found the boats laden with masses of the stone so large, as to require three men to lift them. The owners of the boats were respectable Chinese Musalmáns, who were extremely civil, and readily answered all the questions put to them by Captain Hannay, who learnt " that, although the greater number of Chinese come by the route of *Santa* and *Tali*, still they are only the poorer classes who do so : the wealthier people come by *Bamo*, which is both the safest and the best route. The total number of Chinese and Chinese Shans who have this year visited the mines is 480."

" I have made every inquiry," adds Captain Hannay, " regarding the duties levied on these people, both on their arrival here and on their purchasing the serpentine, and I am inclined to think that there is not much regularity in the taxes, a great deal depending on the value of the presents made to the head-man. Formerly, the Chinese were not allowed to go to the mines, but I understand the following is now the system carried on in this business.

" At particular seasons of the year, there are about 1000 men em-

ployed in digging for serpentine: they are Burmahs, Shans, Chinese-Shans, and Singphos. These people each pay a quarter of a tical a month, for being allowed to dig at the mines, and the produce of their labour is considered their own.

"The Chinese who come for the serpentine, on their arrival at *Mogaung*, each pay a tax of from $1\frac{1}{2}$ to $2\frac{1}{2}$ ticals of silver, for permission to proceed to the mines, and $1\frac{1}{2}$ ticals a month during their stay there. Another duty is levied on the boats or ponies employed in carrying away the serpentine, but this tax varies according to circumstances; and on the return of the Chinese to *Mogaung*, the serpentine is appraised and a tax of 10 per cent. taken on its value. The last duty levied is a quarter of a tical from every individual, on his arrival at the village of *Tapo*, and there the Chinese deliver up all the certificates they have had, granting them permission to proceed to the mines."

On the 9th of April, no intelligence having been received of the messengers sent into *Assam*, Captain Hannay determined to return to *Ava*, and, embarking on a small boat, he reached *Bamo* in eight days, and arrived at *Ava* on the 1st of May. The time occupied in returning from *Meingkhwon* to *Ava* was only eighteen days, while the journey to that frontier post was not completed in less than forty-six of actual travelling,—a very striking proof of the extreme difficulty of estimating the distance between remote points, by the number of days occupied in passing from one to the other, unless the circumstances under which the journey was made are particularly described. That portion of the route between *Meingkhwon* and *Beesa* in *Assam*, which Captain Hannay was prevented visiting, will probably in a short time be as well known as the territory he has already so successfully explored, and the researches in which he is now engaged, extending from *Beesa* in *Assam* to *Meingkhwon* in the *Hukong* valley, will complete the examination of a line of country not surpassed in interest by any, which our existing relations with the empire of *Ava* have afforded us an opportunity of visiting. His labours have filled the void necessarily left in the researches of Wilcox, Burlton, and Bedford, and have greatly contributed to dispel the doubt and uncertainty, which they had not the opportunity of removing. While the officers of the *Bengal* Presidency have been thus successfully engaged in geographical inquiries on the north of *Ava*, the south and western districts have been explored with equal zeal and intelligence by those of the *Madras* Presidency; and the spirit of honorable competition, which has already stimulated the researches

of Drs. RICHARDSON and BAYFIELD, and Lieutenant MACLEOD, with such marked advantage, bids fair, in a comparatively short time, to render the whole empire of *Ava* better known than the most sanguine could have ventured to anticipate. Did the results of such journies and investigations tend only to an increase of our geographical knowledge, they would even then be most valuable: but to suppose that the consequences of this intercourse between intelligence and ignorance are so limited, is to take a most inadequate view of the subject: the confidence inspired by the visits and conduct of a single individual,* has already opened a communication between *Yunan* and *Moulmein*, and the caravans of *China* have commenced their annual visits to the British settlements on the coast: the journey of Captain HANNAY will in all probability lead to a similar result between *Assam* and the northern districts of *Yunan*; and the time may not be very distant, when British merchants located at *Bamo*, will, by their superior energy and resources, extend its now restricted trade to surrounding countries, and pave the way for ameliorating the condition and enlightening the ignorance of their numerous inhabitants.—*Journal of the Asiatic Society of Bengal* pp. 245-278.

4.—*Report on the Physical Condition of the Assam Tea Plant, with reference to Geological Structure, Soils, and Climate.—By* JOHN M'CLELLAND, *Esq., Assistant Surgeon, Bengal Establishment, and Member of the Asiatic and Medical Societies of Calcutta.—Presented to the Agricultural Society of Calcutta, 8th February,* 1837, *by desire of the Right Honourable Lord* AUCKLAND, *Governor General of India, &c. &c. &c.*

[We have been favoured by the talented author with an able pamphlet under the above title, which has been printed in Calcutta as the first fasciculus of the 4th vol. of the *Transactions of the Agri-Horticultural Society*. We have abridged it to suit our pages.—ED.]

Geology.—Approaching the Kossia mountains, I observed small insulated knolls projecting abruptly out of the low marshy plains by which they are surrounded. They are seen extending along the base

* DR. RICHARDSON of *Madras*.—R. B. P.

of the mountains as far as the eye can reach, and proved to be the remains of a former talus, from the fact of the summits of some of them being composed of coarse pebbles and boulders.

The acclivity of the Kossia mountains facing these knolls, may, without any great inaccuracy be divided into three stages. The first a rugged, but gentle slope to the height of about 1500 feet; the second precipices, and the third a succession of summits. Extending along the top of the first stage, and at the base of the second, I found the well marked remains of a raised beach, characterised by a deposite of marine shells, twenty-five species of which, I have identified with an equal number of species comprised in a small collection of fossils from the Paris Basin, presented to the Asiatic Society of Bengal by Mr. Christie. The smallness of Mr. Christie's collection, consisting only of about 150 species, prevents me at present from establishing perhaps, a much more extensive agreement between the tertiary remains of these two remote localities.

Descending at another point, ten miles to the westward of this situation, I found at about the same altitude, a continuation of the line of organic remains; but the fossils were here grouped together in distinct families, as is observed to be the case in the subappennine deposites. I have procured sufficient materials from these beds to enable me to establish their nature, as soon as I am provided with the means of comparing them with the fossils of other tertiary groups which have been examined in Europe.

Without dwelling farther at present on the geology of the Kossia mountains, I shall merely observe that their agricultural character appears to improve much after crossing the valley of the Boga-pany. Previous to that, the surface being composed of horizontal strata, is barren, and without soil except in ravines; but at Muflong, where the rocks become inclined, a fine rich soil is abundantly retained on their surface, while the ravines afford an iron sand, in more than sufficient quantity for all the purposes for which the metal is required in the neighbouring country; but the ore is not found in sufficient quantity to render it an object of that importance, which it otherwise would be, in the vicinity of such extensive repositories of coal as here occur.

Should it be thought desirable to give the tea plant a trial in the Kossia mountains, I would recommend a situation at the western extremity of the valley of Myrung, where the soil is derived from a granular foliated felspar, very similar to the rock that affords some of those tea soils, which have been collected in China.

But for the circumstances of the raised beach, as well as of the dis-

coveries of the late Mr. Scott, at the Colibaree hills, Assam would present itself as an instance of a great valley of denudation. This would also be supposed to be the case, if the mountains on the two opposite sides possessed any characters in common. Porphyry, primitive lime-stone, serpentine, granite, and talcose slates, compose the mountains on the northern side of the valley, while tertiary sand-stones, shell lime-stone, and coal, compose the southern group ; in conjunction with metamorphosed gneiss, green-stone, and sienite.

Here then we have two distinct systems, with the valley of Assam interposed between them. The valley contracts towards its outlet, to a breadth of only twenty miles in Lower Assam ; but in Upper Assam, its breadth is probably fifty miles. In Lower Assam the breadth of the valley is still farther contracted by a small system of hills given off from the mountains on the south ; through these hills, the Bramaputra flows with a pretty uniform current, at the rate of about three miles an hour.

At Gowahatti the Mekeer hills, as they are called, are composed of metamorphosed gneiss, consisting of quartz injected into felspar from below, and containing beds of mica. In other places sienite, also containing veins and masses of quartz occurs ; and at Goalpara, hornblende containing concretions of felspar, constitute the rocks in the immediate vicinity of the river.

At Noagong the rocks composing a portion of the Mekeers, called Solano, are of a magnesian nature, including lenticular masses of the size of large boulders, of granular and compact quartz, and pebbles of various kinds imbedded in a fine, curved, slaty matrix, and the whole arranged so as to represent the figure of an irregular volcanic cone ; near which, in the open plain, an insulated accumulation of granitic masses form a mound of twenty or thirty feet high. Whether these granitic masses were propelled from below, or projected from a volcano, I had no means of determining during my hasty visit to the spot ; but they possess no common character with the other rocks in the vicinity, that I saw.

Without entering farther into particulars at present, I think it will be conceded, that Assam is not a valley of denudation, and that the mountains on either side not only belong to perfectly distinct epochs, but that Lower Assam has itself been subject to very considerable disturbances, the effect of which has been to raise the general level of this part of the surface, by which means the waters in the interior were confined for a short time, until the accumulation of silt obliterated the depression within.

Upper Assam, as may be expected from these views, is an extensive alluvial basin; regarding which, much depends on the accuracy of our general and particular observations, as it brings us at once to the main object of enquiry—the history of the tea plant and the circumstances in regard to soil under which it exists.

In considering the extent and nature of this basin, we are at once struck with the peculiarity of a perfect plain about eighty miles long, and forty broad, surrounded by lofty mountains and invaded by four enormous rivers, besides six or seven smaller ones, the least of which is as large as the greatest river in England.

These streams are so many great channels, by which nature conveys into the valley, the productions of the mountains; and it is only necessary to mention the direction from whence a few of the principal streams are derived, in order to be prepared to find, in the natural history of this romantic and singular spot, a greater variety of objects than a similar extent of any less peculiar situation could be expected to afford.

The first of these great rivers is the Dihong, which enters the valley by a narrow defile in the Abor mountains about twenty-five miles N.W. of Suddyah. Every circumstance seems combined to render the Dihong liable to sudden, or at least excessive periodical inundations, its hydrographical basin extending amidst snows, parallel to the equator from the 82° to the 93° of longitude, along the elevated plateau of the Himalaya.*

The first rise of this river takes place in the beginning of March, and amounts to about fifteen feet, said to be occasioned by the melting of the snow. Towards the middle of April, there is a general subsidence of about ten feet, and the river retains something more than its ordinary level, until the periodical rains set in, when the inundations commence, the river then begins to rise at Gowahatti, where it attains in July and August a height of forty feet above its level during the dry season.

The second great branch of the Bramaputra—the Dibong, enters the valley by a similar defile to that of the Dihong. Between the defiles of these two rivers, which are not above 15 miles apart, there is a remarkably abrupt and picturesque mountain, terminating in three peaks, on the highest of which snow lies for two-thirds of the year. The source of the Dibong is unknown, but it must approach, if it does not

* According to Malte Brun the peculiarity of the inundations of the Nile depends on its course being extended from east to west within the tropics. The inundations of such rivers are higher but less sudden than those of rivers running parallel to the meridian like the Suban-Shieree.

pass within, the mountains on the frontier of China. It forms the natural boundary between the Abor, and the Mishmee tribes.

The third branch of the Bramaputra, is that which retains the name of the great river, from its falling straight into the axis of the main trunk, from the opposite, or eastern extremity of Assam. It enters the valley by a series of cascades, it is said, rather than by a deep defile: and indeed this peculiarity is distinguished at a distance of thirty miles, by the accumulations of rolled stones which have been propelled forward, causing a succession of rapids which gradually increase in number and difficulty. This river, after its entrance into the valley, receives the Digaroo and Kondul rivers from the Mishmee mountains on the north, and the Noa Dihing and Tenga from the south-east. For reasons to be afterwards assigned, it will be well to keep the direction of the two last named rivers in view.

The fourth great branch of the Bramaputra, called Suban-Shieree, takes its origin, it is supposed, in Thibet; and enters Assam from the north, below the junction of the other great branches, and at right angles with the great fluviatile trunk. From its southerly direction, and the peculiarity of its source in the snows of an elevated chain, from which it descends transversely, the inundations of this river take possession of Assam, previous to those of the other rivers. The silt which its floods convey into the valley (where they spread and lose their impetuosity), is consequently deposited so as to impede the course of the Bramaputra. The great stream is thus caused to diverge from its direct course, and from time to time to force its way, by the bursting of new channels. Between two of these at present, an island, sixty miles long and ten broad, is formed at the confluence of the Suban-Shieree, chiefly by its silt.

It has now been shewn that Upper Assam is an alluvial basin, formed by the confluence of various great rivers, which flowing from opposite directions, meet in its centre. I have been unable to determine whether the original surface underwent any subsidence of its former levels, or whether the elevation of the rocks in Lower Assam was the only cause of the production of the basin. The total absence of any rocky protrusions through the alluvium, and the general levels relatively, between Upper and Lower Assam, as well as Bengal, being only such as to afford an ordinary current of about two miles or three an hour, indicate a depression of the older rocks in Upper Assam. More extensive observations, and experiments in boring, can alone determine this point.

The rivers as they fall into the valley, precipitate such portion of

their contents as their waters from diminished velocity are unable to convey further. This has occasioned a succession of low rounded sand hills, which are particularly to be observed on the south eastern side of Assam, at the tea localities of Cuju, and Nigroo where from the rapidity with which the Noa Dihing and Bora Dihing, fall into the valley, such accumulations are most to be expected.

There is consequently a general inclination of the surface, in this direction, extending from the main fluviatile trunk, to the foot of the mountains. Along this descent, the Debru, Bora Dihing and Disung rivers flow in very indolent currents from the S. E. where they take their rise, except the first, in the Naga mountains. If we add to these rivers a small stream which rises in a southerly direction, in the same mountains near Gubru-purbut, we have an accurate definition of the limits of the tea plant in Upper Assam.

Cuju, one of the places in which we found the tea plant, is situated at the source of the Debru; Tingrai, another tea locality, is on the bank of one of its tributaries; and Noadwar, a third situation at which we found the plant, is in a tract subject to the inundations of the same river; and we heard of its existence at Cherrabie, in still closer connexion with this stream.

At the source of one of the tributaries of the Bora Dihing, we examined the tea plant near the village of Nigroo; and heard of its existence at the extreme branch of that river, in hills twenty miles south-east of Nigroo.*

We have also positive information of the existence of the plant, at Borhath, near the foot of the Naga mountains, and close to the source of the Disung; but circumstances prevented our visiting either of the three last mentioned places.

Of the different streams just noticed, whose banks afford localities of the tea plant, the Debru, if not the most interesting, is at least the one with which we are best acquainted. It rises in the sand hills, or undulating country between the Bora Dihing, and Noa Dihing rivers, and derives its first waters from springs situated between the sand and clay deposites. The stream is languid, and not such as to indicate any great difference of level throughout its course, which is about sixty miles in a N. W. direction, but its banks near its source are from twenty to thirty feet high, and the surrounding country is

* The colony of plants alluded to is situated at Namroop; many of our attendents had been there and saw the plant.

dry; while the very reverse obtains in the middle of its course, and from thence to its confluence with the Bramaputra.

During the few excursions we made into the interior, I found other transformations of the original surface of the country, referrible to artificial, rather than to natural causes: such for instance as extensive embankments, raised as fortifications in remote times, when the resources and population of the country must have been in a far different state from what they are in at present. But the remains, in Upper Assam, of such works as are here alluded to, have an interest of another description in this enquiry, distinct from what they would afford to the antiquary.

When we find those artificial embankments, or tumuli, extending for miles through the most deserted tracts of Assam, raised often to the height of 20 or 30 feet above the plain, and overgrown with ancient forest trees; as large as those amidst which the colonies of wild tea plants are found, the question is at once suggested—"May not these colonies of wild plants, have been cultivated gardens, into which the plant was introduced artificially?" A doubt would be thus cast at once upon the indigenous nature of the tea plant, and though it may have since propagated and grown spontaneously for ages, yet the chances against its successful cultivation for commercial purposes would perhaps in consequence be increased.

Farther arguments might be adduced in support of this view, by referring to the antiquities of Assam; which are both extensive and decisive as to the former existence of such a state of society in regard to refinement, as would lead us to conclude that the luxuries of neighbouring countries (and the tea plant among the rest), were probably artificially introduced.*

* At Teespore, near Bishenath, on an eminence by the river side, the surface to the extent of an acre is covered with architraves, cornices, pilasters, columns, and all the essential parts of a splendid building, carved in granite. The ornaments present a mixture of Saracenic and Roman styles. The stones do not agree in their nature with any of the rocks in the vicinity; and from the way in which they are strewed, as well as from the freshness of their angles, would never appear to have been used. Temples of Hindoos are numerous, and about Gowahatti, some of them are very extensive and more elegant than I had previously seen in any part of India. Those that excel most in every respect are the most ancient, and are built of granite. Many of the insulated hills in Lower Assam have their masses sculptured in situ representing gigantic figures in bas-relief; and as such monuments are referred to Buddhists of early date, they prove, that the masses on which they have been marked, have undergone no general change in very recent times, although they do present some signs of the disturbing influence of earthquakes, which are said to be here frequent and severe.

On the other hand, it may be observed in favour of the indigenous nature of the plant, in Upper Assam, that it is not found beyond the bounds of the alluvial basin ; so that we must ascribe to the latter, some natural influence to which we are indebted for the possession of this plant ; as such restriction appears to me to be dependant only on natural causes, which do not alone affect this species, but also various others in both kingdoms of organic nature in like manner.

The plant is traced along the course of the small rivers which enter the valley from the south-east, in a series of distinct colonies ; rendering it probable that the seeds have been transmitted forward along the course of the currents. It is not necessary that the seeds should have been conveyed at once down the current of any one of these streams from a great distance into the valley, or to suppose that their vegetative principle could survive submersion in a current for any length of time without injury. It is enough, that a single seed may have fallen from a Chinese caravan, near the source of one of those fluviatile ramifications which converge to the valley, on every side, over 18° long. and 4° lat., where it may have been deposited under circumstances favourable to its growth and propagation. A colony would thus be established, from which thousands of seeds might be annually transmitted, and although ten thousand of these might be lost, still one of them might be drifted during a flood along the banks of a stream; and deposited under circumstances favourable to the establishment of an advanced colony, and so on.

This view of the way in which the tea plant performed its migrations into Assam is not merely theoretical, as it occurred first from facts which were presented to me, during an examination of the tea colony at Tingrai, as will be afterwards shewn.

The next object is, to inquire whether we have any proof of the direction from whence the plant has been conveyed into the valley. It is necessary to call to mind that Assam is divided from the east to west, by the Bramaputra ; and that in the northern section of the valley thus formed, no tea colonies have hitherto been found, hence the plant would not appear to have been introduced from countries in that direction ; nor did Mr. Griffith find any trace of it in the Mishmee mountains, or even that the Mishmee tribes have any knowledge of it whatever.* On the other hand, a Kamtee of rank, named Chi-long-fu, residing at Suddya, informed the Deputation that in all those countries to the eastward of Assam, tea is used at meals instead of water, and

* Letter to the Tea Committee.

that during the hot season, it is the only drink of those who can afford to procure it—that it is drank at meals by people in good circumstances, and that the poor have it only at feasts, because they cannot procure it at other times. He also informed us, that it is by the common people of those countries with which he himself is connected, the general offering made to great men on visits of ceremony, when compliments are intended to be paid. It is cultivated, he says, in gardens; and plantations are reserved for the purpose of procuring it, and that the expense is equal to about one anna for two pounds weight. When preparing it for use this quantity is placed at once in a large vessel from which individuals of the party help themselves.

He farther assured us, that the tea thus universally used, is identically the same as the wild plant now growing in Assam, and that it is prepared by all the nations east of Suddya, with which he is acquainted, just in the way that it is now prepared by the Singphos, whom it was then supposed we were about to visit.

He said it was cultivated in gardens and plantations for convenience, and for the purpose of keeping up a sufficient supply, rather than from an idea of improving its quality beyond that of the wild tea plant. In their plantations, he informed us, they did not interfere with the growth of the tree, farther than by depriving it of the leaves for which it is cultivated. It consequently attains such a size as to oblige those who collect the leaves to climb upon the branches.

This is the substance of the information we derived from a person of weight, and some political influence at Suddya; but whether it is of much value in the elucidation of the question of the cultivation and manufacture of the Assam tea plant, I shall not at present venture an opinion: but this information, and certain physical indications regarding the direction from whence the plant originally approached the valley, are mutually in confirmation of each other. Thus we have still an extreme eastern depôt of plants at Namroop, the source of the Bora Dihing river. From this, Nigroo may have been directly supplied; but Cuju, as it presents the largest plants, I suspect to be the oldest colony of which we have any description, in the valley; and situated at the source of the Debru river, it is certainly the parent of all those colonies which have been discovered along the banks of that stream.

Topography, Structure, and Soils of the Tea Colonies.—The village of Cuju is situated about twelve miles from the banks of the Noa Dihing river, and twenty miles south of Suddya, in the midst of an extensive forest. It may be approached either by penetrating on elephants directly through the forest from Suddya, or by boats, as far as a spot on the banks of the Noa Dihing, called Cuju gât, from which a foot-path extends through the forest to the village. About half way there is a small settlement of Singphos, consisting of a few families, scarcely numerous enough to justify the term village being applied to their habitations. In their neighbourhood is a patch of ground a little lower than the adjoining forest, appropriated to the cultivation of rice. With this exception the forest is totally uninterrupted from the river to Cuju, where the rice grounds of that village extend over a space of about fifty acres, some two or three feet below the level of the general surface.

The soil of the rice field is in places rich, but superficial, reposing on a grey sandy clay; but generally it is itself grey and clayey. The soil in the forest is however light yellow, and of more sandy consistence than that of the rice grounds, but still of a somewhat clayey texture. We crossed a small stream, the water of which was coloured with what proved on analysis to be oxide of iron. The bed of the stream being sand, we may expect the same process of consolidation to be going on here, as has already been observed in regard to the Noa Dihing.

The site of the village of Cuju, though surrounded by extensive forests, and scarcely elevated above the common level, is drier than any place I had previously seen in Upper Assam. The soil in the village, unlike that of the district generally, is of a rich brown colour, and affords good crops of opium.

The day after our arrival at Cuju, we set out to inspect the colony of tea plants, the first we had ever seen. We descended, soon after leaving the village, into a small depression, which had been cultivated for rice; proceeding about half a mile beyond this, we entered a thick forest, intersected by a small and nearly stagnant stream, the source of the Debru. The ground was somewhat more sandy, than that of the general surface which we had passed over. Pursuing a foot-path that had been recently formed, we came upon low sandy undulations, connected with the former windings of the stream we had just crossed. The sand in places was thrown up into mounds, the highest of which could not be more than twenty feet. After leaving these banks of sand, we had occasion to cross the stream

again; we then entered upon level ground, the soil dark and firm under the feet, covered with grass and a few scattered trees. This was of short extent, as we suddenly entered the forest again and were surrounded by tea plants.

The first remarkable thing that presented itself here, was the peculiar irregularity of the surface; which in places was excavated into natural trenches, and in other situations raised into rounded accumulations at the roots, and trunks of trees, and clumps of bamboos. The excavations seemed as if they had been formed artificially, and were from two, to three, and even four feet deep, of very irregular shapes, and seldom communicating with each other. After many conjectures, I found the size of the excavations bear exact proportion to the size and height of the nearest adjoining trees, and that they never appeared immediately under the shade of large branches. The cause then appeared to be the collection of rain on the foliage of lofty trees; from which the water so collected is precipitated in heavy volumes on the loose and light soil, excavating it in the manner described.

The trenches are from one yard to ten in length, and generally a yard, or two yards wide; and their general figures correspond to the form of the interstices between the branches above. The tea plants are most numerous along the margins of these natural excavations, as well on the accumulations of dry soil raised around the roots of bamboos. The soil is perfectly loose, and sinks under the feet with a certain degree of elasticity derived from dense meshes of succulent fibres, prolonged in every direction from various roots. Its colour is light grey, perfectly dry and dusty, although the surrounding country was still wet, from the effects of rain that had fallen for several days immediately prior to our visit.

Even the trenches were dry, and from their not communicating with each other, it seemed quite evident, that the soil and substratum must be highly porous, and different in this respect from the structure of the surrounding surface of the country.

Extending examinations farther, I found the peculiar character of the soil in regard to colour, consistency, and inequality of surface disappear, with the tea plant itself, beyond the extent of a circular space of about 300 yards in diameter.

It was also to be remarked here as well as in other situations in which the tea plant was afterwards examined, that insulated individuals were smaller in size, the farther they were found detached from the natural limits of the colony; which last were always found to be

marked by certain changes in the soil, except perhaps in a single instance.*

We now continued our journey along a path extending through the forest in the direction of W.S.W., occasionally approaching the banks of the Debru river. The soil in the forest, is similar to that already mentioned. Animals are very few, and consist chiefly of wild elephants; the forest indeed is too damp and shaded to afford a suitable shelter to the animals of Lower Assam, and of the plains of India; and the elephant is perhaps the only creature among the larger animals, who could procure sustenance in such a place. A new species of squirrel (larger than *Sciurus maximus*), which I have named *S. bengmoricus*, seems to be peculiar to this tract. Towards the close of the first day's journey, we crossed a small clear stream running into the Debru on our right; and indicating an elevation of the surface towards the east.

We spent the night in a Singpho village called Cujudoo, and the following day we continued our journey through the forest in a southerly direction. Our path for perhaps five miles, extended along a massive embankment, probably thirty feet high, and overgrown with some of the most ancient trees in the forest. From this we pursued an easterly direction, and after descending from the tumulus, found a tree fern, which I believe proved to be of the same species as that which had been previously found at Cherra-punji. The surface soon became more elevated, and undulating; but still composed of yellow sandy clay. The streams then descended in an opposite, or N. E. direction, running we were told into a river called the Maun; while those we crossed in the early part of the day, run S. W. into the Debru, proving that we had crossed a tract of forest, elevated herhaps about 50 feet above the general plain, with a gradual, or almost imperceptible ascent, and descent, on each side, indicated only by the direction of the rivulets. We then crossed the bed of a small stream of clear water, passing over pipe clay; from thence the white, or yellow sandy clay, over which we had passed ever since we entered the forests, disappeared as well as all undulations; the surface assuming the ordinary character of flatness, to which we had been accustomed, and was chiefly composed of clayey soil, sometimes blue and in places yellow, but without sandy admixture. These appearances continued for a few miles, until we entered the village of Nigroo, on the banks

* I here allude to the western boundary of the upper colony of plants at Tingrai.

of the Bora Dihing river. From thence we entered the bed of a small river which joins the Bora Dihing, called at this place the Maun-moo,* and proceeding up its bed, for the distance of about three miles, reached the second tea colony.

NIGROO.—The soils in which the plant is here found, are of three sorts, each of which differ from that in which it was found to grow at Cuju, but presenting points still more instructive and interesting than the latter colony afforded. The topography of the place, presents to our notice; First, the dry sandy bed of an occasional pond that empties itself by means of a deep drain (said to have been formed by nature, though it looks artificial), extending across the colony of plants, and communicating with the bed of the Maun-moo. Secondly, a mound of tolerably rich, but very light soil, extending in a north easterly direction, and presenting a serpentine declivity to the S. E.

The Maun-moo river partly encircles the spot, giving it the shape of a small peninsula. The level of the river is about 15 feet lower than the surface at the foot of the hillock, or mound, so that during floods the tea plants in the latter situation, must be liable occasionally, (I should think), to slight inundation.

Approaching the spot, from the river, we crossed a zone of almost pure sand, overgrown with reeds, and in the course of a few paces, reached a sandy clayey soil in which we found a few small tea plants; a few steps farther introduced us to a drier, and less consistent soil, in which the plants were found larger, and more numerous. Surrounded by tea plants, we ascended the mound, the soil of whichis light, fine, and of yellow colour, having no sandy character. Here the plants were found still more numerous than in the lower ground.

NOADWAR.—The third tea colony we visited, is near the village of Noadwar, in the centre of Upper Assam, and not above twenty-five, or thirty miles from the Bramaputra.

Proceeding to the spot where the plants are found, we passed over rice grounds which were almost quite under water from the torrents of rain then falling, in the middle of February. Having entered the skirts of a forest which, though not under water, was wet and slippery,

* *Moo,* or *Mokh,* mouth; synonymous with *Moon,* in Bengalee.

and in some places deeply covered with mud; we suddenly ascended from the dry bed of an occasional water course,* and at first sight discovered a total change of soil and vegetation.

From floundering in mud, we now stood on a light, red, dry, and dusty soil, notwithstanding the rain to which it was exposed, in common with every part of the country at the time.

This colony is probably about fifty yards in length and twenty in breadth, and extends along the S. W. brow of the dry channel: the height of the bank on which the tea grows is about five feet. The surrounding low ground is overgrown with reeds, and the higher tracts with forest trees. The surface on which the tea plants are growing is much indented, and excavated; for being loose, it is easily encroached upon, by accumulations of water when they take place in the channels. Thus situated on a loose and defenceless bank at the verge of a forest, this colony of tea plants may be considered as undergoing gradual obliteration from destruction of the surface, and there is reason to suppose that it has at one time been much more extensive than it is at present.

Gubru-Purbut.—The fourth colony of tea plants we visited, is three days' journey E.S.E. of Joorhath, where the plant is found in a bright yellow, or red soil, on the lower extremity of a small range of gradually declining hills, extended about three miles from the Naga Mountains into the valley. The extent of ground which is covered by this group of plants, is about 60 yards in diameter, and of circular shape. The spot is raised about fifty feet above the plain, which is low, marshy, and covered with reeds on the northern and eastern side; but the low ground on the S.W., where a small valley is formed between the hill and the mountains, is cultivated with rice, and contains several villages; but at the immediate foot of the eminence on which the tea plants are situated, the ground is too low and subject to inundation, to admit of any sort of cultivation, so that this locality of the plant may be said to be surrounded by inundated grounds on all sides except on the S. E., where the narrow chain of hills covered with forest, connects it with the Naga mountains.

* Water courses, or what are called Beels, are common features in this part of the country, and are formed by the inundations of the Bramaputra, which, retiring rapidly, have excavated shallow channels in the alluvium to the depth of three or four feet, where the superficial yellow clay interrupts their farther progress. When not too low, they form good rice groundr and pasture.

TINGRAI.—Tingrai is the fourth colony of tea plants we visited in Assam (though I have here placed it fifth and last).

The boundary of this colony, like that of the lower one, is abrupt and defined at that portion which is presented to the direction of the current; while the lower extremity presents a lingering train of straggling individuals extended along the direction of the stream, thus proving the migration of the plant in the course of the currents, from the upper to the lower colony.

Suspecting from these interesting facts, that both colonies were supplied from some more permanent and extensive location of tea plants, I pursued the extreme channel in the direction of its source; and in doing so, found that several smaller channels entered it from the S. E., indicating a gentle ascent of the surface in this direction, from whence probably the tea seeds were directed forward from some original depôt, to the places just examined.* Having proceeded about a mile into the interior of the forest, I found my attendants who were boatmen, and not much accustomed to expose themselves, where the foot prints of tigers were so numerous, had thought it most prudent to return, and on finding myself alone, I followed their example without accomplishing the object in view.

Chemical Examination of the Assam Tea Soils.—Soil from the roots of the tea plant at Cuju. Colour light grey, uniformly fine dusty sand, without consistency. Rubbed between the fingers it feels rough, is without smell; surface broken, undulating, excavated, dry and loose, uncovered with grasses, and apparently arid.

Constituent parts in 200.

Water,	37
Fresh fibres,	1
Vegetable matter,	$5\frac{1}{2}$
Silex,	135
Alumina,	11
Oxide of iron,	$4\frac{3}{4}$
	$194\frac{1}{4}$

Soil of the neighbourhood, taken about 500 yards beyond the boundary at which the tea plants disappear. Colour, greyish black;

* The discovery of an additional colony of tea plants in this vicinity since it was visited by the deputation rather strengthens this view.

surface, covered with grasses, moist, uniform, firm and solid. When rubbed between the fingers this soil possesses considerable coherency and softness.

Constituent parts in 200.

Water,	52
Extractive matter,	5
Vegetable matter,	8½
Silex,	114
Alumina,	9½
Oxide of iron,	4
	193

From the foregoing enquiries it appears that the tea plant of Assam grows spontaneously under slightly distinct circumstances as follows:

1. In the level plain.
2. On embankments or mounds somewhat raised above the plain.

Cuju, Noadwar and Tingrại are examples of the first, Nigroo and Gubru-purbut are examples of the second.

The first class of situations, are distinguished from the general plain by a porous structure, and the peculiar character of maintaining a dry surface under exposure to excessive moisture; the second by a structure less porous than the first. In both, the plants are situated at the verge of inundations which prevail during the greater portion of the year on the adjoining lands.

The important peculiarity of these sites is, that they are less secure from inundation by their elevation than by their structure. Indeed the lower sites are scarcely raised more than a yard above the adjoining flat plains, which are exposed to inundations not merely during falls of rain, but also from the overflowings of the great rivers. But these circumstances, which are sources of fertility to the adjoining lands, appear to produce an opposite effect on the sites of the tea plant, thus causing the peculiar condition on which the presence of the plant in some measure depends. All soluble and subtile matters are prevented from accumulating in the soil of those sites, and are washed as it were from a filter into a loose sandy bottom—all vegetable and animal decompositions, and all chemical operations except the oxidation of particles of iron, are here prevented from taking place. Hence the characteristic colour of the generality of these soils already pointed out. Protected in Assam under the shade of dense forests and a gloomy and excessively humid atmosphere (the latter the most indis-

pensable of all conditions as I shall presently show), the tea plant flourishes in its barren soil along the verge of rivers, lakes, and marshy lands.

Where the requisite porosity of structure is not afforded by subsoils, the defect may be overcome on the rounded summits of embankments, and on the declivities of small hills and undulations, such as those on which the plant appears to be cultivated in China :* and where these last are wanting artificial drains and trenches may be resorted to, either with the view of qualifying an unfavourable soil for the reception of the plant in the first instance, or for supplying the want of suitable porosity.

In the more sandy rice districts, the small ridges which subdivide the fields may be increased in size, and each planted with a single row of tea plants, a practice which would seem to be followed in China although the erroneous notions hitherto entertained regarding the supposed mountain habit of the plant, prevented the example from having been before recommended.

There are however many spots of suitable structure in Upper Assam, that might be selected for new plantations ; the most desirable might be at once chosen, while the old colonies should be carefully preserved for the supply of nurseries. This would seem to be the more necessary, as in case of the seed becoming exhausted by the injudicious treatment of the plants composing the original colonies, the difficulty that might arise in procuring a fresh stock from China might prove fatal to Assam as a tea province. From those tea seeds which were procured from China at an enormous expense to Government, few plants have been reared, and probably not one of those few will ever bear seed. The importance therefore of abstaining from officious interference with the original colonies must be evident. None of them are very great in extent, and it is possible to conceive that as they are all in retired forests some attempts may be directed to the transplantation of the trees in a more convenient but less appropriate situation (as is almost sure to happen on such occasions if *convenience* be at all allowed to enter into our views), and thus exhaust, if not totally destroy the means of conducting more judicious experiments.

Little is to be expected from any attempts that can at present be made to manufacture tea from the uncultivated plant : but still as there is a small establishment on the spot for the purpose, consisting partly

* I shall have occasion to refer to authorities on this subject when considering the climate of the tea provinces.

of Chinese, they might be employed in constant trials upon the leaves afforded by the different colonies in order to detect what the nature and degree of difference may be, between the products of the different soils as well as of leaves of different size. The mode of manipulation adopted with regard to each specimen, and how diversified, should be carefully noted, and reports upon the subject forwarded to Calcutta by the person in charge ; together with specimens of the prepared tea packed in leaden boxes containing those aromatics upon which some of the finer qualities of teas may depend.

Climate.—The wind in Assam is N. E. at all seasons, and the whole valley lies in the direction of its current. Descending from the Himalaya the air derives an impetus from its low temperature, and consequent greater specific gravity than the heated westerly wind. It is not meant that the air in the upper atmosphere in contact with the snow is heavier than the lower strata in the valley, which would be contrary to certain well known laws ; but merely that the air in the vicinity of the mountains above the line of congelation, is rendered specifically heavier than the general air of the same altitude, in consequence of the heat absorbed from it by the snow. It consequently sinks, causing a motion in the warmer air to occupy its place. Thus an upper current is formed while the lower one descends into the valley where its diminished temperature renders it sufficient to overcome the heated land winds which enter from the west, by the great defile of the Bramaputra.

During those months when the westerly winds have greatest power, and the influence of opposing currents from the N. E. extremity of the valley most diminished, in consequence of the disappearance of a larger proportion of snow in that direction ; the westerly winds then extend with lessening temperature and velocity as high as Bishenath in Middle Assam, beyond which they are seldom known to reach ; nor is their power even there sufficient to overcome the influence of the N. E. current, more than for a few days at a time during the hottest days of April and May.

Throughout the cold season, dense vapours arise from the Bramaputra about day-light, and continue to increase until 8 A. M. when they begin slowly to ascend. They are then drifted before the N. E. wind, which from the diminished heat of the valley now amounts only to a gentle movement, the direction of which is modified by the action of the sun's rays on the upper stratum of mist, causing a more or less powerful dissipation, and exciting a movement

in the general mass towards the side on which this action is taking place. The whole of the vapours are thus attracted towards the south, where unless entirely dispersed by noon, their broken masses linger on the northern face of the Naga mountains, receiving daily fresh accumulations, until they are precipitated in heavy rain, seldom however before they have served as an impenetrable canopy to this side of the valley for several weeks.

This tendency of the mists to occupy the south side of the valley, is an interesting point if considered with reference to what I have already stated regarding the absence of the tea plant on the northern side. The plains on the northern side of the Bramaputra, may indeed be considered generally to enjoy two hours more sunshine daily, during the cold season than those on the south, a circumstance which is of itself calculated to influence vegetation, and cause a difference in this respect between the two sides of the valley.

With regard to the cause of these mists, it would be easy to say that they arise from the moisture of the forests ; but if this were all, they should appear after sun-set when the heat of the day is first withdrawn ; the loss of temperature would then cause a condensation in the lower atmosphere, which is not the case in Assam ; nor do the mists first make their appearance in the forests, but on the river, and on such parts of it as are shallowest and most languid in current.

I attended as closely as I could without neglecting other equally important matters, to these peculiar phenomena, and the only conclusion I could come to from the observation of simple facts was, that they arose from the difference of temperature between the water of the Bramaputra and the air, which amounted to a mean difference of 15° Fahr. during the month of December. Throughout that month, in our progress up the river from Gowahatti to Suddya, I found the water at sun-rise vary from 55° to 56° Fahr. and the temperature of the air at the same time, from 38° to 42° Fahr. This difference causes the water to give off more vapour than the air can hold suspended in an invisible form ; partial condensation immediately ensues, and the sensible vapour is then seen curling over every portion of the river, just as steam presents itself to view ascending from the surface of heated water.

Those high altitudes by which Assam is surrounded, occasion a rapid abstraction of heat during the nights of the cold season, in which the waters and the air participate unequally, as conductors of different powers. The latter consequently retains a higher mean temperature than the former, and assists during the cold season to check excessive diurnal variations. On the other hand, in the hot season, when

the radiation of heat from extensive wastes of sand is prevented by the freshes which cover them, and the volume of water increased, as well as the rapidity of the rivers by the melting of the snow; the rivers then present a temperature much beneath that of the atmosphere whose heat they now contribute to lessen, just as they promoted an opposite effect during the cold season. Nor is this influence of large bodies of water upon climate confined to Assam; it applies equally to all great valleys similarly situated, and especially to those inland provinces of China whose productions are so similar.

From what I could learn regarding the temperature of the hot season, it would appear that 82° Fahr. at Suddya, is considered as excessive as 96° in Calcutta; and although the quantity of rain that falls during the year may be supposed from a combination of circumstances, to be much in excess of what falls in Bengal, yet there is reason to suppose that during the months of July, August, and September, the quantity in Assam may be no greater than elsewhere; the absence of any season of perfect drought being the peculiar feature of the climate. If however the theory by which I have endeavoured to account for the peculiarity of wind, during the S. W. monsoon be correct, it is difficult to conceive that clouds and showers should not be frequent, or at least occasional during the months of April and May.*

From these general observations on the climate of Assam, we may venture to infer that in regard to heat and moisture, it possesses many peculiarities when compared with the open plains of Bengal.

Looking down from the Kossia mountains into the valley, in November, it presented the appearance of one vast lake, from the sheet of vapour under which it was concealed for several hours daily.† While ascending the Bramaputra in December, the weather was generally dark and gloomy with some rain. During the time we were in the forests, which embraced the greater portion of January, we

* On two winds of different temperatures and differently saturated coming into contact, the result would be the formation of a cloud or the precipitation of rain according to the proportion of moisture contained in the warmer vapour. See Prout's *Bridgewater Treatise*, 292.

† This was sometimes observed even for several days, and may be considered to have been actually the case during the greater part of the two following months, but being then in the valley we could not perceive it otherwise than by the shade. The effects of these clouds upon vegetation, and in checking extremes of temperature, may be conceived from the circumstance that when they were first observed from the Kossia mountains, a keen N. E. wind blew daily, and from which the valley was quite protected by the vapour.

seldom saw the sun; and the early part of the month was chiefly wet. February, and until the middle of March, was generally wet; nor have I often witnessed even during the regular rainy season, heavier or much more frequent falls of rain than took place in Assam at this period. On the most moderate computation, I do not think we could reckon the quantity of rain that fell during the three months above mentioned, at less than 15 inches; yet during the same period in Calcutta, I find on reference to Prinsep's Journal, that only 2 inches of rain fell—one shower only having taken place in December, January being dry throughout, and February affording but two days on which any rain whatever fell.

I have already hinted at the importance of Zoology as calculated to assist in casting a light upon the peculiarity of climates, and as affording data for the comparison of one with another. If we consider how instrumental birds for instance are, in the dissemination of plants, how essential certain seeds and certain flowers are to the support of certain animals and insects, we perceive at once rational grounds for expecting to be able to trace an accordance between the vegetable productions of our country, compared with those of another, when the Zoology of both agree in particular features; and hence the application of these principles to the present object.

The preponderance of Malayan over the northern forms in Assam, notwithstanding the lofty range of mountains which might be supposed to contribute to an opposite effect, and rather attract animals towards the south is an interesting indication which will be at least corrected, if not confirmed by my collections. But though lofty ranges of mountains afford climates equal to certain proportions of higher latitudes, yet animals in order to enjoy such insulated positions would be confined to ridges only, without being able to indulge their natural wandering propensities except under exposure to the heat of valleys. On the other hand, animals of the south may extend considerably beyond the strict limits of their geographical sphere, by taking advantage of the shelter of mountain chains, and thus experience no very remarkable change of circumstances from what nature intended they should bear; and in this way we may account for many of the peculiarities of the natural history of Assam, which are not confined to the tea plant, but extended to other species perhaps equally restricted in their habitat. In the animal kingdom the interesting genus Ciconia of Cuvier presents two distinct species of crane as large as the adjutant (ciconia dubius) and which are quite unknown in Bengal or any other

part of India. I have already adverted to a large squirrel as peculiar to Eastern Assam, and although it is there extremely common, not an individual has been found in Lower Assam; or even beyond the northern limit of the alluvium. From thence it is probably extended to the eastward, but occurring only in valleys affording similar vegetation, and consequently possessed of similar peculiarities in structure and climate to Assam. The Simia Hylobates agilis Duvaucel a species of ape, appears from the observations of Dr. HARLAN to be almost equally limited to Assam and its vicinity.*

If from the lower animals we now direct our attention to the various tribes of man which compose the several nations by which Assam is surrounded, we shall find the same line of demarcation interposed between the eastern and western varieties of this species, as already observed with reference to other beings. The Singphos, or people who inhabit the Dupha mountains display in the construction of their face, the light colour of their skin, their manners and ingenuity, the almost pure Mongolian or Chinese race. The Nagas on the contrary, who inhabit the vast mountainous country extending from Assam to the frontier of Birma, incline (if I may judge from the few individuals I had an opportunity of witnessing), to the most degenerate of Caucasian Hindoos, but without a trace of their religion. Yet it is a curious fact' that the Kossia tribe which occupies the western extremity of the same mountain-group, are a well marked branch of the Mongolian race, which here appears to have extended to the extreme point where the climate and natural productions cease to resemble those of the countries from whence they were derived; and thus surrounded by powerful Caucasian nations, and intercepted by the Nagas, this insulated people appear not merely to have maintained their independence; but the purity of their blood, as well as distinct customs, language, and religion.

In this way we derive from Zoology additional aid in support of those views which the sister sciences afford, and are taught to look upon the tea plant in Assam, thus associated with the natural productions of Eastern Asia, not as an alien estranged from its own climate, but as an indigenous plant neglected it is true by man, but in the full enjoyment from nature of all those peculiar conditions on which its properties will be found under proper management to depend.

* It is described in his Medical and Physical Researches, Philadelphia, 1835, page 10, as a new species under the name of Simia hoolock.

5.—*Notes on the Agriculture and Rural Economy of the Valley of Nepaul.—By* A. CAMPBELL, *Esq. Officiating Assistant to the Resident.*

[Dr. Campbell has obligingly favored us with a copy of his excellent treatise, under the above title, which forms the 2d fasciculus of the 4th vol. of the *Trans. of the A. and H. Society*, of which we avail ourselves to introduce the general descriptive portion in this Journal. —ED.]

The entire surface of the valley of Nepaul is either under regular cultivation, or capable of being so. It is completely free from rocky and stony tracts, as well as sandy wastes; and, with very few exceptions, the fields have a superficial stratum of nutritious soil, a foot or more in thickness. The area of the valley, in the absence of a professional survey, cannot be correctly stated; nor is it easy to make a near approximation to it, on account of the irregular outline formed by the basis of the boundary mountains, which throw spurs inwards in some places more than a mile in length, forming bays or subordinate valleys of considerable extent. The average extreme length from east to west, including the retiring valleys, may be estimated at 20 miles, with an equal breadth, similarly calculated. The valley proper, or such an area as might be squared by drawing a line along the inner extremities of the mountain spurs, has a diameter in either direction of about 15 miles. Within this space however, is included the low ridge of hills which being given off at Dochoke, the western mountain boundary of the valley, runs eastward and by south, crossing the channel of the Bagmutti river, until it terminates in the general level near the village of Sussanally, situated at the south-east corner of the valley. The above limits give as a maximum average of arable surface 400 square miles, or 3,56,000 English acres, and as a minimum average, 222 square miles, or 1,42,000 acres. The former, on account of the hilly portions which intervene in the subordinate valleys, and are but partially cultivated, is considerably I believe beyond the mark, while the latter estimate, from excluding altogether the retiring valleys, is to that extent deficient, as the surface of these subordinate valleys, is of greater extent than the uncultivated proportion of the mountainous spurs which form them. We may I think safely assume as a mean, and correct diameter to the arable land, 18 miles in each direction, which gives an area of 324 square miles, or 2,07,360 English acres asunder, or fit for agricultural operation, and for yielding the higher descriptions of produce. There are precipitous portions of the mountainous faces bounding the valley, particularly on the south and

west, where Indian corn and Murwa are occasionally cultivated; but the angle of these is so acute and the soil so unproductive as to render the husbandry of the rudest possible description and their produce too scanty to entitle them to be included in the regularly cultivated valley land. To speak generally, the mountain bases bounding the valley, too steep to admit of being cut into terraces, are excluded from the area above laid down; and with sufficient reason, as, in such lands, water cannot be retained for the growth of rice, and the quality of the soil is such as not to admit of the sowing of wheat, or any of the numerous and nutritious pulses, which abound in the more level lands. The crops of such places are limited to Indian corn, Murwa, and Phofur.

The general appearance of the valley, viewed from the summit of any of the surrounding mountains, is that of a series of hills with intervening valleys, irrigated plentifully by miniature canals, and traversed in a waving line from north-east to south-west by a moderately sized river, in which many of the streamlets directly terminate, and in the direction of which all are bending their course. This appearance is not so striking in the drier months of the year, although sufficiently evident even then, as during the rainy season, when the Bagmutti river by which the entire waters of the valley quit its boundaries, may be most aptly likened to a large venous trunk of an animal body, formed by innumerable smaller branches, each collecting at their source the fluid which animates as it runs, the bodies which surround it. From the cloud capped mountain peaks these little feeders take their rise, increasing as they rush down the precipitous sides, until, arrived at the more level base, they grow calmer and less fretful, permitting themselves to be diverted by innumerable chann els into the fields below, and their speed to be wasted by diffusion over the terraced flats prepared for their welcome reception. Others of these feeders issue in considerable volume, and at once, from the foot of the hills; forming abundant and permanent springs of the clearest water. This occurs especially at the foot of Nagarjun, a high round-shaped hill forming the western boundary of the valley, covered by a thick stratum of soil from base to summit, and having in the neighbourhood of the spring no water course for the torrents along its face. At Nilkanth on the northern, and at Godawrey on the southern boundary, there are similar springs which continue to pour forth a steady stream throughout the year. Each of the springs is the favourite resting places of the respective presiding deities, whose images alone are now extant; but according to popular belief these

holy emblems are of divine origin, not having been made by human hands.

Viewing the valley from its centre, and contrasting its surface with the masses of mountain which surround it, it has the appearance of a plain gradually rising on all sides to the bases of the mountains, but a more careful examination points out a division of its surface into two separate elevations. These I shall call the *higher* and *lower levels* of the valley when describing the agricultural occupations of different seasons, as the general system and routine of husbandry varies on each. In the above division of the valley's surface, the hill sides under rough cultivation are not included. The lower level through which the two principal rivers (Bishomutti and Bagmutti) and their feeders run, is for the most part, nearly flat, having a very gradual descent from either side of the valley towards the main streams. Its soil is less clayey in general than that of the upper level, and from the greater facility of irrigation and certainty of flooding during the rains, its crops of rice are more productive, and its value for purchase and rent higher. The upper level, has for the most part, an elevation of from 30 to 80 feet above the lower. In some places the one gradually runs into the other, the transition being unaccompanied by any sudden or defined line, terraces of cultivation extending from the top of the upper level, down to the river edges. In other places the one is defined by perpendicular descents of 50 or more feet, along the basis of which the rivers sometimes have their course, while in a third place these precipitous banks point out the different levels far removed from the streams. The extreme height of the upper level is no where more than 100 feet above the lower; for the hill of Simbhunath although, at first sight belonging to this division, is really a spur from the neighbouring hill of Ek Changu. The hill near the temple of Pusputnath is elevated more than 100 feet above the Bagmutti, as this stream winds its course round three sides of it; but this hill may also with propriety be excluded from the valley levels and looked upon as a portion of a low range of hills stretching from north to south, and crossing the course of the Bagmutti. The Gankurun hill, which is a spur from Sheopooree, forms the northerly extremity of this partially defined range; on the south it vanishes gradually into the ordinary higher level of the valley lands.

To recapitulate summarily, we have in the valley of Nepaul, an area of 325 square miles of arable land, forming a basin of uneven surface surrounded by a circular chain of mountains, varying in height from 500 to 2,000 feet above the plain, watered

by innumerable streams, and blessed with a healthy climate and a fruitful soil. The capital of Nepaul is placed by Buchanan in north latitude 27° 42′, and east longitude 85° 36′, the mean elevation of the valley is reckoned at 4,782 feet above the plains of Bengal, and the heights of its surrounding mountains by barometrical measurement are as follows.* Mahadeo Poker, or the highest peak of the eastern boundary, 6,786 feet; Jaber Powah, the north-east boundary, 5,716; Sheopooree, or the highest peak of the northern boundary, not known; Colonel Powah, on the nort-west corner, 6,654; Chandragiree, or the southern boundary, 6,600; and Phoolchoke, bounding the south-east corner, 6,800. These circumstances exercise such a powerful influence over the produce of the soil, as regulators of climate, that they will not, I presume, be deemed out of place as prefatory observations. The mean annual temperature of the valley is 64 . The population of this area was estimated by Mr. Hodgson, in 1832, at no less than 2,90,000 souls, which allowing 400 square miles as its inhabited extent, gives the extraordinarily large number of 725 to the square mile: a proportion so far as I am aware, not known to exist in any country of the world, and one which I believe Mr. Hodgson is willing to allow to have been rather exaggerated even for the valley of Nepaul. It is however certain that this valley teems with human beings, its whole surface being sprinkled with towns, villages, and insulated dwellings. No portion of India with which I am acquainted can be compared to the valley of Nepaul in density of population, and it is not improbable that after the most correct estimate shall have been obtained, it will shew a population, compared with its area, equal in extent to that of any country in civilized Europe. Allowing the utmost possible extent of area to the valley within its mountainous boundaries, we could not assume more than 30 miles in length, and as much in breadth,† as its dimensions, or 900 square miles; and at this exaggerated rate, we should still have, by Mr. Hodgson's estimate, a population of 322 and a fraction to the square mile. In East Flanders, as containing the maximum rate of all Europe, a recent census gives 560 souls to the square mile. In the most populous parts of Ireland the greatest proportion to the square mile is 345 souls. In Berkshire in 1831 it was only 193 to the

* Captain Robinson is the author of the observations which give these measurements.

† These are the limits assumed by me taking in the sub-valleys around the big one.—B. H. H.

square mile. In Bengal it is estimated at 203 to the square mile,* and in the cultivated portion of Orissa it did not exceed, when Mr. Stirling's report was compiled, 135 to the square mile. The population, whatever be its real amount, is almost entirely agricultural, as, with the exception of the soldiery stationed at Cathmandu, amounting to 6 or 7,000 men, and the chiefs and higher officers of Government every inhabitant is more or less directly engaged in the culture of the soil. The artizans, religious orders, and persons employed in the government offices do not, it is true, actually labour in the field, but being almost universally the representatives of the Irish middlemen, and Scottish tacksmen, they come correctly under the denomination of Agriculturists. The poorer artizans, such as carpenters and bricklayers, divide their time between the practice of their trades and the culture of their little fields, while the better class of tradesmen, although enabled to confine the work of their own hands to their crafts, are invariably holders of land, sometimes cultivating it by means of hired labourers, but most commonly by the system of subletting to the Japoos, or the strictly speaking agricultural class of the Newars. The arrangement usually made by these land holders is for the receipt of one half the produce, the actual cultivator retaining the other, as his wages of his labour.

Formation of the valley soil.—The soil of the valley, although considerably diversified, is in the mass composed of alluvial deposite, there being no traces on the general surface either of the primary or secondary rocky formations; indeed, throughout the entire extent of both levels, there is not a stone of any magnitude, and scarce a pebble to be found. The only rocks accessible within the valley, are those composing the diminutive ranges described as spurs from the surrounding mountains, and trans-secting the basin. These are of several kinds, some of them, as in the more easterly portion of the range which tends from the west towards Sussanally on the east, contain a considerable quantity of carbonate of lime, but so intimately blended with a clayey slate stone, as not to admit of being converted into quick lime by burning, although it will frequently effervesce on the application of muriatic acid.

* Mr. Bayley estimated the population of Burdwan in 1814 at 600 to the square mile, but this district is incomparably the most populous one in Bengal, as Lancashire is of England. In the county the population is estimated as high as 800 to the square mile, a difference from that of Berkshire greater than between Burdwan and Bengal generally.

To the west of the Sumbhunath hill again where there is a stone quarry, the rock is either of grey granite, or of a crumbling sort of sand-stone tinged with a reddish yellow colour. The Gankurun hill is composed, at its northern extremity, of hard granite with a superficial stratum of clayey slate, which is under constant decay, leaving a reddish clay soil along the sides. The granitic portion is exposed to the extent of 20 or 30 yards in the bed of the Bagmutti as it passes through a cleft on the northern extremity of the hill, the stratum forming an obtuse angle (say of 20 degrees) with the horizon. Of whatever variety, the superficial soil must, I think, be regarded as a debris formed during ages of decay from the surrounding mountains; for although the composition of the soils occupying the central parts of the basin may not be easily traceable at the present day to their mountain progeners, the similarity in many places of the soil along the mountain bases, and stretching for many hundred yards beyond them into the valley to the earthy or rocky formation of the hills immediately over them is distinctly manifest. An example or two of this may be recorded; the southern aspect of the Sheopooree boundary, is formed, to an elevation of about 800 or 1,000 feet from the mountain's base, of a white micaceous sand-stone, and we find the superficial stratum of soil which extends into the valley, on the higher level, for about a mile, of a very light sandy nature, largely mixed with mica. The superficial stratum of the valley face of the Nagarjun mountain is principally composed of a stiff and hard red clay, to which we find corresponding in the whole of the cultivated land lying along its base from the Sumbhunath hill to Ballajee, a distance of three miles, a great predominance of this substance,

The process of addition to the valley land from the mountain debris is in some places at this time in such active operation, as to be distinctly observable in annual additions to the cultivated spots extending up the declivities of the mountains. On the valley aspect of Chandragiree which forms the south west boundary, this process is very obvious. The valley by traditional lore is described as having been an immense lake, the Sumbhunath and Pusputnath hills forming lands on which the gods found resting places and appropriate sites on which to be worshipped. The drawing off the waters is of course ascribed to the direct agency of some of the local deities, and "*the Sabre* cut," though the southern boundary of the valley forming the only outlet for the present waters, and the one by which the lake was emptied, is still pointed out as the handy work of a renowned demi-god (Manja Ghosa by name). An earthquake, with which the people of the Himalayas

are sufficiently familiar now-a-days, as they doubtless were in remoter times, is an agency they will not accept of as more likely to have burst asunder the rocky barriers of the lake and given exit to its waters. Humboldt or Jacquemont could probably have solved this interesting question. It is remarkable that in no part of the valley are fossil shells of aquatic races to be found, a circumstance sufficiently curious when taken in combination with the opinion of the former state of the country. Dr. Buchanan seems to have assented to the popular notion on the subject, without offering an explanation of his views. It is however certain, that if the narrow passage through which the river now flows did not at any previous time exist, the tract above it, which includes the whole valley, must have been a large lake, formed by the pent up waters of the surrounding hills, which now form the Bishomutti and Bagmutti river, with the innumerable tributary streams. Not a drop of water finds exit from the valley, save by this one narrow outlet, which pours its torrents in a southerly direction through the Mahabharat and lower ranges of hills, into the plains joining the Ganges near Monghyr. The waters from the outer side of the northern, eastern, and western mountainous boundary of the valley, run east and west, the ormer falling into the Koosi, the latter into the Tirsoolgunga of the hills or Gunduck of the plains. The Koosis (for there are several streams bearing this name within the hills east of Cathmandu), unite their waters in the plains, and fall into the Ganges opposite Bhaugulpoor. The Tirsoolgunga reaching the plains at Tirbeni, flows through Sarun to the Ganges, joining the latter river at Hajeepoor.

Winds, Rain, Pressure of the Atmosphere and Temperature.—Not being at present prepared to give a specific account of the climate of the valley from personal meteorological observations, it will be sufficient to indicate generally its character as it has reference to the productions of the soil.

The most marked characteristics of the valley climate, are its extreme humidity and the irregularity of the winds, as to direction and intensity. The former of these circumstances, arises from the retention of so much water as is required for raising rice crops, together with an annual average fall of 50 inches of rain water ; and the latter, from the high mountainous boundary girding the valley, by which the currents of air passing over their summits are prevented from reaching the valley's surface. It is often difficult to ascertain correctly from what direction the

wind blows, so calm is the atmosphere, or so irregularly do blasts from the mountains rush down into the subjacent plain. This calmness and irregularity in direction of the winds is most marked during the rains, and early part of the cold season, or from the middle of June to the end of January. From the beginning of February to the commencement of the rains, the wind blows during the day pretty steadily from the west, veering round to the north-west at evening during the months of February, March, and April, and to the south-west at the same time of the day during the month of May and early part of June. From the commencement of the rains until their termination, the wind blows *generally* from the south, and south-west; *occasionally* from the east, and south-east, and very rarely indeed from the west or north-west. After the cessation of the rains, which is generally simultaneous with that season in Behar, the winds are more various, blowing occasionally from all quarters, but *most rarely* from the west, and *most frequently* from the north. A register of the direction of the wind kept at any one part of the valley would but ill suffice to ascertain accurately the course of the wind for the day throughout the valley generally. It is almost always observable at the confines of the valley that the wind blows from the mountains at evening, and although I cannot state the fact from observations made at the same hour in different parts of the valley confines, I have, when in these situations, so invariably observed the wind to blow from the nearest mountain, that I believe at evening during the dry and hot season especially, the wind blows from all points of the horizon into the valley at the mountain bases; after which the currents of air are joined with the wind prevailing in the valley proper, with which they are carried along in its direction. The breezes which come rushing from the mountain sides after and about sunset, ought not perhaps to be noted in ascertaining the directions of the wind in this valley as they are doubtless no more than currents of denser air, descending to take the place of more rarified volumes of atmosphere, but as these winds sometimes extend for a mile or two from the mountains, they are apt to mislead, as to the direction of the actually prevailing wind in the valley generally. Spurs from the mountains, which form bays or subordinate valleys protect these spaces from the influence of the prevailing current of air to the distances above noted. The average annual temperature of the air in the valley approximates that of the climates of the southern European countries: a circumstance which will explain the ready growth of the peach and pomegranate, wild and in the open air. The greater moisture of this climate than of those of

southern Europe, explains the wonderful fertility of its soil in raising rice crops.* The following abstract of recorded observations, although insufficient for the purpose of settling with precision the mean temperature and pressure of the atmosphere of the valley gives an indication of it which may be usefully referred to, in comparing the course of the season, and the round of agricultural employments here, with those of India and Europe.

The mean height of the mercury in the barometer during the month of January, 1837, calculated from daily observations at 10 A. M. and 4 P. M. and reduced to the 32d degree of Fahrenheit's thermometer was 25.448 inches. The mean of similarly made odservations for the month of June, 1836, was 25.154. Taking these months respectively as those during which the mercury stands higher and lower than any others of the year, we have as the mean altitude of the mercurial column for the year, 25 inches, 301 thousandths or 3-10ths.

It is remarkable, that the months which shew the greatest elevation and depression of the barometer, should also exhibit *inversely* the highest and lowest degree of temperature throughout the year. The mean temperature of the air during the day outside and in the shade, for the month of June, 1836, calculated from observations taken at 10 A. M. and 4 P. M. was 78° of Fahrenheit's scale.

The mean of observations similarly made in January, 1837, was 47° of Fahrenheit's scale. The temperature of these two months, which exhibits the extreme of heat and cold during the year, gives as the mean annual temperature of *the day* at Cathmandu 62° of Fahrenheit's.† It is unnecessary to keep in mind here, that as no *night observations* have been quoted, the mean temperature of the 24 hours of these two months cannot be correctly stated, and further, that as the temperature of the day is at its maximum here, at 4 P. M. at which hour observations made have been quoted, the mean temperature of the day and night together, must be considerably below 62 degrees. The mean minimum temperature of January, 1837, calculated from observations taken by me from a self-registering thermometer, exposed to the air in a western verandah, was 32 degrees of Fahrenheit's scale. The mean maximum of observations taken by Captain ROBINSON at 4 P. M. for June, 1836, is, I find, 81°. If it is

* The mean annual fall of rain north of the Alps is rated by MALTE BRUN at 25 inches. The fall south of the Alps at 25 inches. In this valley it was 50 inches in A. D. 1835.

† The observations for June, 1836, above quoted are by Captain ROBINSON; those for January, 1837, by myself, but with the same instruments kindly lent by Mr. HODGSON.

allowable to calculate the mean temperature of the year from the mean maximum of the day, during the hottest month, and from the mean minimum of the night, during the coldest month, we shall have 55° 3′ of Fahrenheit's scale as the mean annual temperature at this place. It is necessary to state, that this latter mode of striking the mean annual temperature is only given as subordinate to the first mode, as the mean minimæ taken by me, and the mean maxima by Capt. ROBINSON were from different instruments. The result is nevertheless of some interest pending the collection of a more full and correct body of meteorological facts. The mean annual temperatures of the air in some of the southern European countries as recorded by MALTE BRUN, affords a ready means of comparison between the climate of this valley, and the climates of those favoured countries. At Palermo, the mean annual temperature is rated at 62 degrees of Fahrenheit. The mean annual temperature of Lisbon is 60 degrees; that of Rome 59 degrees of Fahrenheit, and that of Paris 50°. The mean of these four climates gives a temperature of 55° $\frac{4}{5}$ which is the mean annual temperature (according to the more recent authorities than MALTE BRUN), of Montpellier, the climate of which is unrivalled in Europe or out of it for salubrity to the human species.* The mean annual average of the day at Cathmandu, has been rated above at 62°. of Fahrenheit, and the mean annual temperature of the day and night at 55° 3′. By the first mode of calculating the average, we have at this place a mean annual temperature for *the day* exactly similar to the mean annual temperature of Palermo, while by the latter method, we have for the day and night a mean annual temperature corresponding to that of the sanatarium of all Europe, Montpellier. It is probable, that a temperature between the two, may be found to give the most correct estimate of the mean annual temperature of this valley, say 58° of Fahrenheit, which correspond with the estimate now before me of the climate of Montpellier by MALTE BRUN. The following tabular view will render the comparison of these climates more easy.† Fractional parts of a degree not being of much moment in quoting the indication of temperature by Fahrenheit's scale, are omitted.

* For a notice of the climate of Montpellier, see a paper by Dr. ROYLE in the Asiatic Society's Journal, which is not at present within my reach. MALTE BRUN rates the mean annual temperature of Montpellier as nearly the same as at Rome, viz. 59°, but Dr. ROYLE from more recent authorities states it at 55°.

† Whether I am correct or not in stating the annual mean temperature of Montpellier at 55°, does not materially signify, as the recorded statement of MALTE BRUN making it under 59° brings its estimate so far as temperature is concerned, wonderfully near that of this valley.

Table of Mean Annual Temperature by Fahrenheit's Thermometer.

	Valley of Nepaul during the day.	Valley of Nepaul for the day and night.	Palermo.	Lisbon.	Rome.	Paris.	Montpellier. By Malte-Brun.	Montpellier. By more recent authority.
Mean annual temperature.	62°	58°	62°	60°	59°	50°	57°	55°

Course of the Seasons, with some of their more prominent distinguishing features.

The general characters of the seasons in this valley are, from its geographical situation, a good deal influenced by those of the neighbouring plains, but its elevation above them and its mountainous confines modify here the truly tropical character of the Tirhoot and Behar seasons to a close affinity with the seasons of the temperate zone. Cathmandu is situated in the 28th degree of N. latitude, and has an elevation of about 4,800 feet above the sea; but as it is admitted by competent authority,* that 600 feet of elevation is equivalent to one degree of latitude, in affecting the temperature of the air and climate of a country, it is necessary in fixing the latitude, to estimate it at 36 degrees, as the parallel line, on other parts of the earth, with the climates of which that of Cathmandu should correspond. A comparison with those of Malte Brun's "European Sections of Climates," which occupy the line of lat. 36, corroborates this doctrine in so far as the average temperature is concerned, and also in some respects as regards vegetation.

Section 15 in lat. 35.43, includes the peninsulas and islands of Greece, as well as Crete and much of the Mediterranean. Section 16 in lat. 36.44½ includes "the state of Genoa, Tuscany, the states of the Pope, Naples, Malta and Corsica." Section 17 in lat. 36.43$\frac{1}{12}$ includes Spain and Portugal. In the first of these we have Palermo,† averag-

* Decandolle, and so far as memory serves me, by Humboldt.

† Palermo is in lat. 38°, although included in one of these sections of European Climates.

ing 62° as the annual temperature. In the second, Rome, averaging 59°, and in the third, Lisbon, with a mean annual temperature of 60°. These temperatures correspond remarkably with ours, as do in some respects the vegetable productions of these countries. In the South of Italy, rice, oranges and myrtles abound. In the Mediterranean climate, " the scarlet flowers of the pomegranate, the elegant myrtle, and the fragrant exhalations of oranges obscured under a dark green foliage, convince the stranger that he is in the garden of Europe.* In the valley of Nepaul, the wild apricot, peach, pomegranate, and raspberry, the cultivated orange, fig, citron, quince and apple, and the finest odoured roses, myrtles, lilies, and carnations may well persuade the Anglo-Indian that he is not far from the garden of Asia.

The year here with reference to vegetation may be correctly enough divided into five seasons, of which two are the most prominently marked, viz. the winter and rainy season ; the former by the complete repose of vegetation and nature, as manifested by the russet hue of the grass, and the bare brown earth of the cultivated land ; the latter by the excessive luxuriance and vigour of the vegetable world. Coming between the winter and rains, we have a pleasant spring, and a short summer, and between the cessation of the rains and winter, a bright and brilliant autumn. In a climate free from sudden vicissitudes of temperature during the day, as well as on the change of seasons, and remarkable for its equability, and temperate character, it is not easy to define the separate seasons by dated limits. But the following partitions of the year, have each their distinguishing marks in the vegetable kingdom, as well as to the animal senses. The winter commencing about the 15th November, and continuing till the 1st of March, is marked by heavy morning fogs, an average temperature in the house of about 48°, frequent hoarfrost at night, brownness and death of the grass fields, and the total absence of green (save towards its termination when the wheat gets up), from the arable land. The spring is ushered in on the early days of March, by occasional evening storms from the N. W., followed by showers of rain, or hail, a delightful breeze from the west, which is welcomed into every house by open doors, springs up at noon and blows till sunset. Quiet vernal showers are frequent ; willow trees, apple trees and Indian lilacs, put forth their leaves and blossoms ; the grass begins to sprout ; the wheat fields are clothed in verdant hues ; the birds begin to pair and sing, and nature throughout all her works is busy in reanimating her children, which for a while, were permitted to rest from their labours. Summer sets

* Malte Brun's Geography, vol. iii. p. 53.

in with the month of May; storms from the N. W. with westerly breezes continue, and occasional showers give a refreshing coolness to the air, now sometimes heated to 80 degrees. The cultivator is employed in sowing rice, and reaping wheat, this short season combining the climate and labours of an English summer and autumn with the cultivator's operations during October and November, in the plains of India. The rains are ushered in as in Bengal by thunder and lightning, and usually commence at the same time as in Tirhoot and Sarun. With the first fall the transplanting of the great rice crop begins, and with their cessation the harvest of the spring sown, or upland rice. The rain falls frequently in torrents as in tropical countries, but often quietly and for days together, the sky being generally cloudy: vegetation of all kinds is now in its utmost vigour, the crops grow with an astonishing rapidity, and the grass requires incessant cropping or eating by cattle to keep it down. Early in September there is a considerable diminution of the temperature of the air; thunder and lightning again commence. The rain falls more suddenly, and at longer intervals; the sky becomes clearer, and less cloudy, and by the 15th of the month, a new season has fairly set in. This season (the autumn), is marked by the pleasant and congenial mildness of the temperature to the feelings. A bright day is preceded by morning fogs and succeeded by skies as clear, and mellow as those of Italy. The face of the country is now a variegated map of green and golden yellow, with every intermediate and bright tint from growing, ripening and ripe crops; with the month of September the upland rice harvest commences, nor does the harvest throughout the valley meet with interruption until the end of November.

The seasons as above slightly sketched are five. The winter commencing 15th November; the spring commencing 1st March; the summer, 1st May; the rainy season, 15th June, and the autumn, 15th September. The winter lasts $3\frac{1}{2}$ months; the spring, 2; the summer, $1\frac{1}{2}$; the rains, 3, and the autumn 2 months.

Concluding Remarks.—It occurs to me on coming so near the termination of these notes, that three subjects of much interest have been overlooked, and that however small the amount of information in my memoranda concerning them, it may still be worth transcribing. The first of these, viz. the diseases, or destructive agencies to which crops are subject here, will not occupy many lines.

The cultivators are familiar with what I have frequently observed here, and with what our English wheat crops are often injured by. The

common term for the blackening of wheat ears is *smut*, regarded by the vulgar in Europe as well as here, as a disease. But a correct and rational explanation has been furnished by the Entomologists.* The insect known in England, whose destructive operations on wheat are precisely analogous to what is observed here, is a small orange coloured midge (Cradamya tritica), which deposits its eggs in the floret of the wheat, towards the end of June and throughout July.† The consequence of this is, that the anthers of the florets on which the larva feed when produced from the egg, are totally destroyed, and no seed is formed in the ear, which becomes black and powdered. This disease is not very general in Nepaul, but I have annually observed it to exist in the wheat crops, and although I have not seen the insect alluded to, I have no doubt that it is the cause of this effect. The wheat flowers in April, after which the smut appears. The depositing of its eggs in June and July in England, will not invalidate the idea of its being the same animal which lays its eggs here in April, as nature adapts the breeding seasons of all animals to the occurrence of the necessary favourable circumstances. The Newars attribute the smut to the state of the wind, or of the atmosphere, in general ungenial to the young wheat ear; but are disposed to believe that there is more of it in wet, than in dry spring seasons. Wheat alone of all the white crops is subject to smut. The next disease of crops prevalent here is, languishing and whitening of the young rice plants, when only a few inches above ground; this is attributed to the attacks of a large grub, called kiongki or root worm, of a black or blue colour, generally the thickness of the four finger, sometimes as thick as the thumb, and about two inches long. It is supposed by the natives to be produced, and to thrive best in rotten manure, and to devour the seed and young radicals of the plant. The kiongki is most destructive to the gohya or upland rice, attacking it soon after being sown, and continuing its ravages until about the middle of May, after which it ceases. The people do not know of what flying insect this grub is the larva, nor have they any remedy against its attacks except removing it from the fields when they see it. The third disease of white crops is a premature whitening of the ears of rice (both kinds), and the failure of the grain in them. This is attributed by the Newars to the attacks of a small grub the size of the common white maggot, the body of which is white, the head black and hard; it is called the *sheo-ki*, the marrow or pith worm.‡ The sheoki

* Messrs. Kirby and Masham.

† See Natural History of Insects in Lardner's Cyclopædia.

‡ Ki in Newari is the generic term for worm or grub. Kiong is root, and sheo the marrow or brain of animals, and pith of trees and vegetables.

is supposed to eat the roots of the rice plants, but its prey more especially is said to be the stalk and juices of the plant; for obtaining the latter of which it cuts the plants at the joints, after which the ear whitens without filling. The natives attribute the drying up of the ear and plant, to the drinking of its milk (sap), by the grub, which prevents the due formation of a full sized grain. The visitation of locust flights is the only remaining evil to be contended with by the cultivators from the insect world. There have been three annual but trivial visitations of these destructive animals within the last five years. They arrived on these occasions in May, and remained four or five days each time. Whence they came or whither they went, could not be ascertained. The natives here say they come from the plains and from the west. The Newars indemnify their losses by the locusts by collecting them in large quantities and eating them. They remove the wings and either fry or make curry of them, and consider them very good. I have seen them dressed, and tasted the dish, but cannot praise its taste or flavour. The fruit trees of the valley gardens, are the prey of a most formidable and destructive species of grub. It is about an inch and a half long, sometimes bluish coloured, sometimes yellow; it makes its attacks on the roots as well as the stems of the apple, pear, plum, and apricot trees, drilling a hole like a gimlet right into their substance, where apparently revelling on their sap, and completes their ruin as fruit bearers, and often destroys their lives. When this animal makes its entrance into the stem from without and above ground, it leaves a round hole fit to receive a common pea, and sends out behind it small grains the colour of the tree wood, which on handling crumble into the finest powder.

The appearance of these grains and their dry sapless structure induce the belief that they have been passed from the animal per anum.* The

* This grub is an inch and 1-8th long, 1-6th inch in diameter at the head, some thing in vent, as its head is the largest part and the body tapers to the tail. The head is a brownish red colour, and is formed of a very hard shell-like substance, on the anterior aspect of which there are a few delicate white hairs. The upper part of the mouth as well as both sides are formed of this shelly hard substance, the lower part of it, of a white soft substance like the body of the animal. The body is formed of twelve distinct rings of an uniform yellowish white colour. Along each side of the animal close to its belly is a row of brownish coloured spots, one on each ring. The animal has altogether 8 pairs of feet, distributed as follows: 3 pair sharp pointed directed towards and attached to the three first rings from the head; 4 pair shorter, close together, pointing to the ground, and to the 6th, 7th, 8th, and 9th rings; and lastly, 1 pair similar to the last or abdominal ones, at the vent attached to the last or 12th ring. Its body when cut open, discharges a thin clear and slightly viscid fluid, sap doubtless.

moisture of the soil, and warmth of the air during the rains conduce greatly to a profusion of insect life in the valley, and at that season the air actually teems with thousands of these busy creatures, none of which, save those above enumerated, are accused of being at all injurious to the cultivated productions of the country.

The next circumstance to be glanced at is an interesting one. The people employed in the cultivation of the valley are composed of two distinct races of men, which are divided into several totally different tribes. The Newars, who form by far the greater part of the agricultural classes (perhaps in the proportion of 6 or 8 to 1), personify in features, language to a considerable extent, in religion, and in usages, the Chinese or Thibetian race. The Brahmuns and the Khas of the Parbutteah division of the population represent the other or Indian race. The Mayars, Gurungs or Murmis, who form the remaining tribes, do not so readily admit of correct classification as these races.* The two former profess Hindooism and practice its ordinances in a very convenient and easily accomplished fashion. While the last, the Murmis, profess and practice the Boodhist religion and have a language like the Newars, indubitably derived from the trans-Himalayan stocks.

The Newars cultivate almost the whole of the land on the flats of both levels; they use the digging hoe exclusively for turning up the soil and live in towns and villages of tile and brick. The brahmuns and Parbutteahs are generally, if including Mayars and Gurungs, engaged in cultivating the soil. They occupy the confines of the valley, the subordinate valley which recedes from it, and the lands fit for yielding crops along the declivities of the mountain bases. These people use the plough partially, but not generally, and live in insulated cottages built of stone, or unburnt bricks, and generally thatched, rarely tiled.

The Murmis (indifferently distinguished by this name or by that of Bhooteas) cultivate generally the hill soils facing the valley, rarely holding lands on the flooded flats, and often extending their little patches of cultivated land and their mud and stone built and grass

* The whole mass of the population is readily referred by physiognomy and language to the Northern or Mongoul race, but is divisible by language dialectically; and by palpable varieties of the same caste of formed features; these divisions are for the whole kingdom, Limbu, Lapchu, Kiranti, Kacharia, Murmi, Newar, Jaria, Gurung, Mayar, Khas. The last is a mongrel race derived from an indigenous tribe so termed and from low land emigrants, chiefly of the sacred order, who have essentially modified the Tataric attributes of the Khas. The other tribes are still in speech and aspect Northmen, and most closely affiliated.—B. H. Hodgson.

thatched cottages, to the very tops of the boundary mountains. The Murmis use the plough, but not often; their locations being generally much too steep for it. This is but a general indication of the localities of the different tribes employed in agriculture; individuals of these races and tribes, are to be met with in all parts of the valley and its confines. The Mewar however very rarely indeed leaves a village to fix himself on the mountain tops or sides, nor will the Murmi, if he can help it, live on the flat flooded parts of the valley. The brahmun's ubiquity is most conspicuous; he is to be found in the flatest parts, on the confines, and on the tops of the surrounding mountains; but as his numerous privileges, and holy character often enable him to be exempted from the exclusive drudgery of the field, his residence on the flooded flats arises generally from his desire of being near the larger towns and temples, whence he can visit the charity bestowing, and pious portions of the richer community, or exercise his vocation as a teacher of slokes or pronouncer of munters among people little able, or anxious as his rural neighbours generally are, to question his competency as an instructor and guide.

Proceedings of Societies.

Royal Asiatic Society.—Proceedings of the Committee of Agriculture and Commerce.

April 8, 1837.

A Committee was held this day at one o'clock.

Present:—The Right Hon. C. W. Williams Wynn, M. P.; Sir Charles Forbes, Bart.; Sir George Thomas Staunton, Bart.; Colonel Briggs; John Fraser, Esq.; Dr. Horsfield; Louis H. Petit, Esq.; Colonel Sykes; Captain Harkness.

On the proposition that the Right Hon. Mr. Wynn, the President of the Society, do take the Chair, Mr. Wynn suggested that Sir Charles Forbes, who had taken so lively an interest in the success of the Committee of Agriculture and Commerce, should be elected its Chairman;

but that till that gentleman arrived, he would be happy to supply his place. This suggestion was unanimously agreed to, and

It was Resolved,—That Sir Charles Forbes be requested to accede to the nomination.

On the arrival of Sir Charles Forbes, the resolution of the Committee was communicated to him; to which having kindly acceded, he was duly elected Chairman of the Committee of Agriculture and Commerce, and he took the Chair accordingly.

The Secretary read the following Minutes of the Council of the Society:

"July 16, 1836.

"Resolved,—That the Committee of Agriculture and Commerce do consist of the President, Vice-Presidents, and Members of the Council, and of the following gentlemen:—the Hon. Mountstuart Elphinstone; Major-Gen. Sir Henry Worsley, K. C. B.; Sir Whitelaw Ainslie, M. D.; Colonel John Briggs; John Crawfurd, Esq.; James Cropper, Esq.; John Fraser, Esq.; Dr. Horsfield; M. Scott Moore, Esq. M. D.; John Forbes Royle, Esq."

"February 22, 1837.

"*Rules for the Committee of Agriculture and Commerce.*

"1st. That all Members of the Council be, *ex-officio,* Members of the Committee.

"2d. That Members of the Committee not Members of the Council, shall go out at the Anniversary, and that others from the general body of the Members of the Society shall be elected in their room; or the same Members may be re-elected. The election to be by ballot.

"3d. That the Committee do from time to time report their proceedings to the Council.

"4th. That any person not a Member of the Society, desirous of furthering the objects of the Committee, may be at liberty to subscribe for the same.

"5th. That all subscriptions for such objects be kept separate from the general fund of the Society, and applied to the objects of the Committee only.

"6th. That all subscribers of one pound and upwards be entitled to copies of all printed proceedings of the Committee."

Resolved,—That the Committee are anxious to relieve the Secretary of the Society at the earliest practicable period at which their funds will permit, from this additional call on his time and exertion; but in

the mean while, they hope that Captain Harkness will have the goodness to conduct the business of the Committee.

Resolved,—That the Secretary be authorized to obtain occasional assistance, at an amount of expense not exceeding sixty pounds per annum.

A mass of Papers were submitted to the Committee, containing the Replies of the several Collectors under the Presidency of Madras, to Queries suggested by Mr. M'Culloch, on statistics, manufactures, commerce, &c., and transmitted to India by the Committee of Correspondence of the Society.

Resolved,—That these papers be conveniently arranged for reference; and that a list of the Queries, with marginal notes indicating the corresponding number of the Reply, the places from which, and the persons by whom answers have been returned, be prepared.

Resolved,—That Mr. M'Culloch be informed of the receipt of the replies to his queries from Madras; and that he have access to the same.

Read the following communications :—

1st. From Mr. Harman Visger, of Bristol, on Lichens, with specimens, &c. &c. ; and expressing his conviction that the extensive regions of the East must produce, in abundance, some of the known, and many of the unknown, though probably not less valuable, Lichens available for dyeing; that a large and certain supply of good sorts would greatly stimulate the consumption, which has been much checked by the short supply and high price of the best-known Lichens used for dyeing; that, at present, he estimates the annual import at from 60,000*l* to 80,000*l*.; that he would be happy carefully to test any specimens that may be sent to him, and to report on them; and that he had sent to the Committee such specimens of Lichens as he had then been able to procure, with a list and paper of instructions, not confined merely to them, but comprising others which he would send so soon as he could procure them.

2d. From Mr. Southey, of Coleman Street, on East Indian Wool, with specimens, &c. &c.

3d. Extract of a Letter from Messrs. Forbes and Co., of Bombay; on Indian Iron.

Resolved,—That the thanks of the Committee be returned to these gentlemen for their kind attention; and that the list of Lichens and

paper of instructions drawn up by Mr. Visger, and the letter from Mr. Southey, be printed in this day's proceedings.

Resolved,—That the specimens of Lichens furnished by Mr. Visger, of the ammoniacal liquor for extracting the colour, and of the colour required, be sent to the different Presidencies of India, and to Ceylon and China, through the medium of the home and local Governments, and to the several Horticultural and Agricultural Societies already established in India; and that fifty copies of the Committee's Proceedings of this day accompany each assortment of the specimens.

Resolved,—That the subject of Mr. Southey's communication on East Indian Wool, and of the extract of a letter from Messrs. Forbes and Co., of Bombay, on East Indian Iron, be allowed to lie over until the result of the examination of the expected investments of those articles be known.

Read a letter from the Horticultural Society of London, dated the 31st ultimo, enclosing a paper of proceedings of the Meerut Horticultural Society, and the report of the Members of the Committee to whom these communications had been referred.

Resolved,—That extracts from the paper of proceedings of the Meerut Horticultural Society be published in the Committee's proceedings of this day; and that in all similar cases, papers be referred to particular Members for their report thereon.

Professor Royle suggested that specimens of the species of Lichen used in India for the purpose of dyeing (one of which is extensively employed in the Northern provinces, and is there called Chulcheleera), be obtained, and sent to Mr. Visger for the purpose of being submitted to experiment.

Resolved,—That the Committee take measures to obtain specimens of those Lichens; and that they be sent to Mr. Visger for experiment.

An offer was made by Professor Royle, to furnish a list of all the plants of India which yield oil.

A similar offer was made by Colonel Sykes, with reference to the plants of the Dekkan which are suitable to the purposes of domestic economy.

Professor Royle also promised to prepare a paper on the subject of Caoutchouc, and to submit it to the Committee, at as early a period as his present numerous avocations would permit.

Resolved,—That the Committee will be happy to avail themselves of the kind offers of Professor Royle and Colonel Sykes.

Resolved,—That J. G. Malcolmson, Esq., be nominated a Member of the Committee.

Resolved,—That letters be addressed to the Horticultural and Agricultural Societies of India and of England, expressive of the wish of this Committee, to enter into communications with them on all subjects of mutual interest to the respective institutions.

List which accompanied Mr. Visger's Specimens of Lichens, &c.

" *Lichens of Commerce.*

No. of Specimen.	Commercial Name.	Botanical Name.	Value per Ton.
1.	Canary Orchilla Weed	Lichen Rocella..	250*l.* to 350*l.*
2.	Cape de Verde ditto....	——	200 to 300
3.	Western Island ditto....	——	150 to 230
4.	Madeira ditto..........	——	100 to 150
5.	African ditto..........	——	80 to 120
6.	South American ditto..	——	80 to 120
7.	Sardinian ditto.........	——	30 to 45
8.	Cape of Good Hope do..	——	20
9.	English ditto..........	——	No commercial value
10.	Canary Rock Moss....	Unknown....	80 to 90
11.	Sardinian ditto......	(supposed) Pustulatus	70 to 90
12.	Pustulatus ditto, of Sweden, Norway, and England....	Lichen Pustulatus, or Gyrophera..	20 to 40
13.	Tartarous Moss......	Lichen Tartarus..	20 to 40

" *Lichens liable to be mistaken for those of Commerce, but possessing no value.*

No of Specimen.	May be mistaken for	Points of Difference.
21.	Nos. 1 to 9.	The bad is flat, and has a bitterish taste ; the good is cylindrical, and not bitter.
22.	No. 12.	The difference is apparent, but the Villous is generally more or less mixed with the Pustulatus whenever collected.
23.	No. 10.	The great similarity between the good and bad Canary Mosses, renders, the collection of the good a matter of some difficulty.

" *The Good* has a nearly white powder on its surface, towards the

centre; the under surface is of a gray colour, and is not hairy; if wetted it does not turn of an orange colour; its edges are flat and thin.

"*The Bad* has no mealy white powder on its surface; its under side is hairy, and blacker than the good; its edges are usually more or less knobbed, and on being wetted it generally becomes of an orange colour.

"No. 24, contains a mixed sample of good and bad, which has been wetted with water.

"The useless Mosses greatly outnumber the useful, and vary from each other, in some instances, by such slight shades of difference, that the above specimens of them can serve little more than to call minute attention to the subject. A *test* for the discovery of colour is therefore necessary.

"*Test.*—Take liquor ammoniæ, very much diluted with water, but strong enough to retain a powerfully-pungent smell—half-fill a phial bottle with the same, then add of the Lichen (being broken up to a convenient size), so much as will lightly fill up the liquor, so that the whole may be readily stirred about. Care must be taken to leave at least one-third of the bottle for air. The bottle must be kept corked, but be frequently opened, and the contents stirred with a small stick. The colour will begin to exhibit itself in a few hours, and the more rapidly in proportion to the warmth of the place in which it is kept; but the heat should not exceed 130° Farenh. A piece of white silk placed near the surface of the fluid will show the colour before it would otherwise be perceptible. This test will only serve to show where colour exists, but will not develop it to its fullest extent.

"*Localities.*—The good sorts are generally found in rocky or stony districts, or where dry stone walls abound; in the neighbourhood of the sea,—or if distant from the sea, in places exposed to sea breezes. The more valuable are met with in volcanic islands. My own experience has been principally in the Canaries, where I find the more arid the situation, the better the quality of the Lichens. When the land is high and humid, the useless sorts alone are met with. In dry places near the sea, there are only the good sorts;- and there is generally a belt between the two, in which both good and bad are found on the same stones, and not unfrequently overrunning each other.

"There is with the samples a small bottle of ammoniacal liquor, of

the strength suited for test; and also a small bottle of the colour to be produced."*

Mr. Southey's Communication.

"*London, 24th Nov.* 1836.

"We have much pleasure in offering you the following observations on the Wool imported into this country from Bombay, by which you will perceive there is in India a race of sheep which produces Wool that can be applied to useful purposes in some of our manufacturing districts; at the same time it will be seen that, with due attention to the assortment of the Wool, and to the improvement of the breed of sheep, a more valuable description of Wool may be produced.

"Most of the Wool which has hitherto been imported into this country from India, has been found of a short staple, with a vast quantity of hairs interspersed through the Wool (what is technically called kemp hairs): they will not receive dye, which renders such Wool unfit for general use, and consequently confines its application to the more ordinary branches of manufacture, such as blankets, and other low quality of goods.

"It evidently appears there are various descriptions of Wool produced in India, as we have seen some of a superior quality, which we are given to understand was produced in the province of Guzerat, some of which we estimate to be worth 15*d.* to 18*d.* per lb.

"The whole of the Wool hitherto imported from thence, came from the island of Bombay, we are therefore unable to form an opinion where the Wool is grown; but should the information we have obtained prove correct (that it is produced in Guzerat, and that that por-

* The Government of Madras, to whom the samples and test were sent by the *Royal Asiatic Society*, has forwarded them to the Literary Society, in whose Apartments they may be seen by any one desirous of inspecting them. Dr. Wight has made drawings of the lichens which have been transferred to stone, for the purpose of preparing representations, to make them better known. These will either appear in a future Number of this Journal, or be circulated over India, to aid the views of the Committee of Agriculture and Commerce of the Royal Asiatic Society.—Editor *Madras Journal.*

tion of the province is under British sway), it may be deserving consideration, whether an improvement in the quality of the Wool would not prove an advantage to this country.

"Under this assumption, we shall proceed to make the following observations :—

"During last year, there was imported into London 773 bags of Indian Wool, and into Liverpool 624.

"1397 bags—these were sold at public auction, at $4\frac{1}{4}d.$ to $14\frac{1}{2}d.$ per lb. They were chiefly white, and well washed: there is occasionally found a few black locks interspersed through the bags, which ought to be carefully excluded, as the Indian sheep's Wool is generally applied to the manufacture of white goods, consequently any admixture of coloured Wool tends to deteriorate its value.

"We have discovered amongst the finer qualities of Indian Wool, a considerable portion of yellow and discoloured locks, which operates very materially against its sale. In order to remove such an objection, it is requisite the discoloured wool should be selected from the white, and each kind packed in separate bags, by which means an increased competition for the article would be produced; at the same time its value would be thereby enhanced. To which we may further add, the Wool would be bought with greater avidity, as it could then be immediately applied to the various purposes of manufacture without further trouble or expense.

"To those who may feel the laudable desire of producing an improvement in the breed of sheep, and quality of their Wool, we would recommend the introduction of some of our best-woolled English rams amongst the Indian ewe flocks, as by so doing, the quality of the Wool would be materially improved, inasmuch as it would thereby become both a better and more useful class of Wool; at the same time the quantity would also be considerably augmented.

"We remain, Gentlemen, &c."

APPENDIX.

MADRAS, 15*th October*, 1837.

SIR,—I have now much pleasure in sending you a specimen of the work spoken of at page 74 of the last Number of the Journal. The plant figured is a new species of the natural order *Asclepiadæ*, nearly the whole impression of which has been struck off from my own press. I may here observe that I am well aware of my present imperfections in the difficult art of Lithography, but, as every successive trial exhibits some improvement on the preceding one, I am encouraged to anticipate ample success, when some further practice has conferred skill in the management of the press and in the performance of the various manipulations to be gone through in the process of printing from stone, and trust that my first number will afford satisfactory evidence of the style in which the work will be finished; thinking, at the same time, that the specimen now put forth may be looked upon, all things considered, as an earnest that the work itself will be found an useful aid to Indian botanists and by no means discreditable to the state of the arts in India.

Emboldened by this early success, it is with no ordinary feelings of satisfaction, that I contemplate the prospect which it holds out, of enabling me to carry into effect a design which ten years ago I was preparing to enter upon, the publication, namely, of a series of figures of Indian plants, under the title of *Illustrations of Indian Botany*: success being rendered more certain by the advantages derivable from my present official situation, as the work may be looked upon as part of the duties of my office; and, in this light, has received the sanction and approbation of the Madras Government.

These Illustrations have been undertaken in the hope of effectually aiding the advancement of botanical science among us, and thereby extending our acquaintance with numerous curious and useful plants, the value of which is known to few, or the knowledge is confined to particular districts, though the plants themselves may be widely distributed; and in the not less cheering expectation of permanently bringing to light, under systematic denominations,

many others endowed with the most valuable medicinal properties, of which I have received, from really competent observers, accounts so satisfactory, that they could not fail to produce a strong feeling of regret, that the narrators were unqualified to give me more perfect information regarding them. Specimens of such, gathered when in flower, and dried between the leaves of a book, or a few sheets of paper, in the manner detailed in a former communication,* might easily be transmitted from any part of India, if packed between the boards of an old book, or in stiff paper, and prove of the greatest value, especially if accompanied with notes detailing their uses, and mode of preparation; and as, in the composition of these notes, no scientific knowledge is required, I trust I shall be favoured with many such communications.

Botany has hitherto spread with tardy steps among us, the catalogue of Indian botanists having never, at any one time, comprised more than a few names: her most palmy days having undoubtedly embraced the concluding years of the last, and first quarter of the present century; during which, Koenig, Roxburgh, Rottler, Klein, Heyne and Buchanan Hamilton flourished.

When we contemplate the impediments which these truly great men had to surmount in arriving at the eminence they justly attained in their favourite pursuit, partly originating in the imperfection of books treating of Indian plants, and partly from the engrossing duties they had to perform, the intervals of which, only, they could devote to botany, we cannot too much admire their perseverance and devotion to science; while they afford a striking example of how much may be done by a skilful division of our time, and a careful appropriation of our leisure to scientific pursuits.

While we thus admire their industry in obtaining knowledge, we equally regret that, with the exception of the illustrious Roxburgh, leisure sufficient was not granted to any one of them to leave a comprehensive written record of the extent of his acquirements, for the benefit of succeeding labourers in the same field: hence, we are constrained to acquire much of our knowledge of Indian plants, in the same roundabout way that they did, that is, from general systems of Botany (greatly enriched by them, certainly), in place of local Floras.

These systems, embracing as they do the vegetation of the whole globe, are necessarily very concise, and the species so briefly described, as not seldom to render it next to impossible to identify the plant from its specific character. One object of the present work is to remedy, in

* See No. 15, p. 429.

some degree, this defect, which even the most carefully drawn characters, cannot always avoid, owing to the inadequacy of language to find terms sufficiently precise for the designation of the innumerable forms which the vegetable kingdom presents, and especially for distinguishing the varying forms which the same plant, when produced under circumstances tending to increase or diminish its luxuriance, is apt to exhibit.

The insufficiency of language alone, to convey just ideas of the forms of natural objects, has led naturalists, ever since the invention of engraving, to have recourse to pictorial delineation, to assist the mind through the medium of the senses; and, prior to the time of Linnæus, not without good cause, since nothing could be more vague than the language then employed in description. Impelled by this cause, the number of figures some of the older writers published, is truly astonishing. The precision of modern scientific language, the generalization of the innumerable objects of natural history into classes, orders, tribes, and families, and the accuracy and minute details which the representations of recent artists present, have fortunately all combined to diminish the necessity for the innumerable figures of the older naturalists, the latter cause having increased their cost so greatly, as materially to diminish their production, even to the extent required for the elucidation of the rapid advances natural history is now making.

The vegetable treasures of India have undoubtedly been highly honoured by the magnificence of the works dedicated to their illustration, as those of Rheede, Roxburgh, and Wallich, amply testify; but, unhappily for science, the first is very rare, and they are all so costly, that few can afford to purchase them, while, from their size, they can only be conveniently consulted in the library. In spite, however, of these drawbacks to their more general use, they have been of immense service to Indian Botany, and are alike honourable to their authors and to the countries which produced them, while the value of the last is vastly enhanced, by several very admirable memoirs on different natural orders by some of the most distinguished living botanists.

The work which I am preparing to enter upon, is of a humbler, but I hope not less useful, description; its object being to furnish, at the cheapest possible rate, a series of accurate figures of plants, with copious analysis of the parts of fructification, so as, in the words of a highly talented correspondent (the author of the tabular view of the generic characters of Roxburgh's Flora Indica), to supply the Indian botanical amateur with the 'one thing needful' towards acquiring a correct knowledge of the principles of the natural method of classification, by presenting him with a series of diagrams, if I may so call

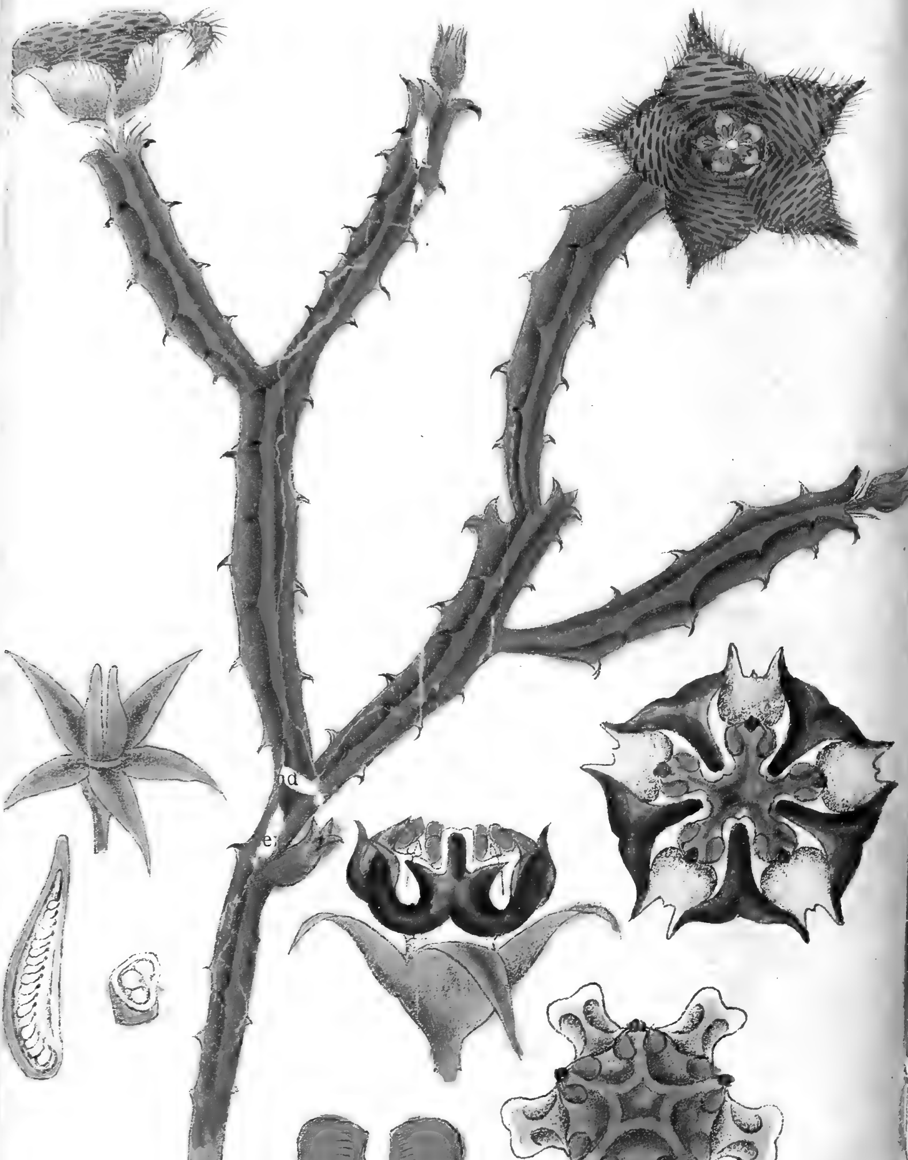
them, which he can compare, point by point, with the written characters of the natural orders, selecting for illustration, as often as circumstances will permit, such plants as are valued on account of their useful properties.

In inviting public support to an undertaking of a kind so novel in Madras, it is necessary to give some information regarding the plan and cost of the work, though neither can as yet be said to be definitively determined upon. Several plans have suggested themselves, but the following seems to merit the preference.

The quarto size will be adopted, as affording more room for analysis and freer scope to the artist in making the drawings, a very considerable number of which are already prepared. The figures are to be coloured, and on each, in addition to the name of the order and plant figured, it is proposed to write the *Tamul* and *Teloogoo* and occasionally other names, in both native and Roman characters ; and, lastly, each plate, in addition to its own number, will have the general number of the species in my Prodromus, if the plant is already described there, to facilitate reference, and after arrangement, should that become necessary. The letter press, in place of (as usual in such works) consisting of simple descriptions of the plants figured, and which can be little else than repetitions of the characters already published in the Flora, will, in the hope of rendering this portion of the work more generally useful and agreeable to both the botanical and general reader, be devoted to remarks illustrative of structural peculiarities ; the valuable properties which predominate, either in the individual figured, or in the order to which it belongs ; the methods adopted for procuring these, and peculiarities of culture, where such are required in their production.

In extent, it is not expected to exceed three hundred plates (but may possibly fall short of that number), to be published at the rate of about one hundred annually, in numbers, commencing in January 1838, or so soon as the names of one hundred subscribers are received ; and continued, either monthly or every alternate month, as may be found most generally convenient and economical. The estimated cost to subscribers will not exceed thirty rupees, per volume of one hundred plates ; one half of which is the cost of colouring alone, the remainder being charged for the letter press (which will be copious), lithography, paper, drawing, &c., and at this price it is nearly fifty per cent. under the English price of similar works.

This low price is effected by charging little more than the actual cost; it forming no part of my plan to reap personal profit from a work, the conducting of which I look upon as part of my present official duties. But, as it cannot expected that I should be a loser



ungia del. *Boucerosia pauciflora.*

by my public engagements, I think it necessary to add that prompt payment is indispensable to the continuance of the publication; as it is quite impossible for me to carry on so costly a periodical from my own very limited resources, and on these alone it must mainly depend in the outset. In England, authors of such works are differently situated. There, they contract with a publisher, possessed of the means of continuing the publication until the probability of remuneration is ascertained; but he, to remunerate himself for the risk and sacrifice of capital at the outset, charges a profit of from 30 to 40 per cent. on the cost, while he enjoys every facility which former experience, and the advanced state of the arts in Europe, give, to ensure the work being got up in the best style and at the lowest charge. In Madras the case is totally different: this is the first publication of the kind ever attempted here; we are, therefore, without experience, have no practised publishers, no colourists, find it even very difficult to get colours, and must depend on the chance of the market for our supplies of paper, in place of ordering it direct from the maker, of whatever size, quality and price might appear most suitable; here, in short, every thing must be done for the first time. I mention these incidental sources of disappointment in anticipation, lest imperfections should occur at the outset which might be unavoidable in Madras, but which, in more favourable circumstances, would justly merit censure.

In conclusion, a few words are required to make known the accompanying figure. The genus *Boucerosia* was first established in my Contributions to the Botany of India, and then consisted of two species only, *B. umbellata* and *B. crenulata;* both of these are at once distinguished from the present, by having their flowering branches terminated with a many flowered umbel, of rather long pedicelled flowers, whereas in this they are solitary, or few, and short pedicelled; thus forming a second section in the genus, which may now stand thus:—

§ I. Floribus umbellatis
 Umbellis multifloris.
 B. umbellata corollæ segmentis glabris.
 B. crenulata corollæ segmentis longe fimbriatis.

§ II. Floribus subsolitariis.
 B. pauciflora corollæ segmentis ciliatis.

To ROBERT COLE, ESQ.
Editor to the Madras Jour. of Lit. and Science.

Yours very faithfully,
ROBERT WIGHT.

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY, FOR THE MONTH OF JULY 1837.

Days.	Barometer at 4 A. M.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Thermometer at 4 A. M.	Thermometer at 10 A. M.	Thermometer at 4 P. M.	Thermometer at 10 P. M.	Rain. Sun rise.	Rain. Sun set.	Evaporation.	Direction of Wind. 4 A. M.	Direction of Wind. 10 A. M.	Direction of Wind. 4 P. M.	Direction of Wind. 10 P. M.	Weather. 4 A. M.	Weather. 10 A. M.	Weather. 4 P. M.	Weather. 10 P. M.
1837	Inch.	Inch.	Inch.	Inch.	°	°	°	°	In.	In.	In.								
July 1	29,832	29,906	29,792	29,850	82,3	85,8	90,3	86,0	0,097	...	...	s w	w	n w	s w	Cloudy	Haze	Cloudy	Cloudy, lightning.
2	,800	,866	,760	,802	84,8	86,4	91,0	85,0	...	...	...	w	w	w	swbyw	Cloudy	Cloudy	Cloudy	Cloudy do.
3	,756	,816	,730	,800	81,6	86,0	90,0	87,0	...	...	...	s w	s w	w	s w	Cloudy	Cloudy	Fl. cl.	Clear do.
4	,778	,854	,754	,844	84,5	86,3	90,0	86,4	...	...	...	s w	swbyw	s s w	Calm	Clear	Clear	Cloudy	Cloudy do.
5	—	,882	,756	,884	—	85,9	91,0	84,2	0,107	...	3,708		w	s e	s w		Th. haze	Fl. cl.	Rain do.
6	—	,908	,792	,800	—	86,9	90,0	82,4	...	...	...		s w	s s e	s		Th. haze	Cloudy	Cloudy do.
7	—	,900	,792	,884	—	87,5	88,2	83,5	...	...	...		w	s s e	Calm		Clear	Cloudy	Cloudy do.
8	—	,910	,804	,874	—	86,3	88,0	85,0	0,108	...	...		s w	s s e	s		Haze	Fl. cl.	Fl. cl. do.
9	—	,874	—	,832	—	87,0	—	84,3	...	...	...		s w	—	s		Clear	—	Fl. cl. do.
10	—	,900	29,802	—	—	87,4	89,8	—	...	...	...		w	s e	—		Clear	Fl. cl.	— do.
11	—	,912	,772	29,838	—	87,6	88,2	84,2	...	...	...		w	s s e	s		Haze	Fl. cl.	Clear do.
12	—	,860	—	—	—	87,9	—	—	...	...	3,951		w n w	—	—		Clear	—	— do.
13	—	,860	29,755	29,832	—	86,3	92,0	84,4	0,259	...	...		swbyw	s w	s		Haze	Haze	Clear do.
14	—	,898	,750	,910	—	86,0	89,5	84,9	...	...	...		n w	s e	s s w		Haze	Haze	Clear do.
15	—	,952	,864	,936	—	86,8	88,0	84,4	...	...	...		w	s e	s		Haze	Th. haze	Clear do.
16	—	,928	—	,864	—	87,5	—	84,1	...	...	...		s w	—	s		Clear	—	Haze do. [ltg. &rain.
17	—	,856	29,752	—	—	86,8	88,0	—	...	...	...		s w	s s e	—		Clear	Fl. cl.	Brisk squall at A. M. thr.
18	—	,916	,840	29,928	—	83,3	87,0	83,8	0,185	...	...		swbyw	s	s		Haze	Th. haze	Clear, lightning.
19	—	,952	,860	,914	—	86,3	90,0	84,2	...	...	3,652		w	e n e	s		Clear	Clear	Clear do.
20	—	,904	,816	—	—	86,4	88,0	—	...	...	...		n w	e s e	—		Clear	Haze	— do.
21	—	,870	,864	—	—	86,1	85,5	—	...	1,274	...		n w	w	—		Haze	Cloudy	— do. thunder.
22	—	,920	,854	—	—	80,7	83,5	—	...	0,427	...		s w	swbys	—		Cloudy	Cloudy	— do. do.
23	—	,922	—	29,902	—	82,8	—	82,6	...	...	...		w	—	s		Haze	—	Cloudy do.
24	—	,906	29,814	,876	—	82,4	86,5	82,3	0,097	...	...		s w	s w	s		Cloudy	Th. haze	Cloudy do.
25	—	,886	,802	,850	—	82,4	84,5	84,0	...	...	...		s w	n w	s		Th. haze	Cloudy	Haze do.
26	—	,866	,768	,828	—	84,2	87,7	85,0	...	...	2,832		s w	w s w	s		Th. haze	Cloudy	Th. do. do.
27	—	,868	,756	,852	—	84,7	90,0	87,2	...	...	...		s s w	w s w	s w		Haze	Cloudy	Haze do.
28	—	,884	,772	—	—	86,4	91,7	—	...	...	...		swbyw	w s w	—		Clear	Fl. cl.	— do.
29	—	,916	,778	29,850	—	87,2	91,0	85,4	...	...	...		s w	e s e	s w		Clear	Fl. cl.	— do. thunder.
30	—	,896	,808	—	—	85,9	87,7	—	0,100	...	...		s w	s e	—		Clear	Fl. cl.	— do. do.
31	—	,880	,802	29,898	—	87,2	88,0	84,8	...	...	...		s w	e s e	s		Clear	Fl. cl.	Th. hz. do.
Mean	29,792	29,893	29,793	29,863	84,0	85,8	88,7	84,6	...	...	...								

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY, FOR THE MONTH OF AUGUST 1837.

Days.	Barometer at 4 A. M.	10 A. M.	4 P. M.	10 P. M.	Thermometer at 4 A. M.	10 A. M.	4 P. M.	10 P. M.	Rain. Sun rise.	Sun set.	Evaporation.	Direction of Wind. 4 A. M.	10 A. M.	4 P. M.	10 P. M.	Weather. 4 A. M.	10 A. M.	4 P. M.	10 P. M.
1837	Inch.	Inch.	Inch.	Inch.	°	°	°	°	In.	In.	In.								
Aug. 1	—	29,908	29,804	29,894	—	86,4	85,0	83,8	... ...	0,494	... ...		S W	S E	S		Haze	Cloudy	Cloudy th. litng.
2	—	,928	,816	,890	—	84,5	88,0	83,7	0,327	... ...	3,662		S W	S	S W		Clear	Fl. cl.	Clear lightning.
3	—	,956	,846	,880	—	84,4	88,0	85,0	0,117	... ...	... ...		W	W N W	S		Haze	Th. haze	Haze do.
4	—	,912	,832	,912	—	82,4	89,0	84,2	0,037	... ...	... ...		S W	W N W	S		Cloudy	Th. haze	Cloudy do.
5	—	,900	,826	,924	—	85,3	85,5	84,4	... ...	... ...	... ...		W	N W	S		Haze	Drizzling	Cloudy do.
6	—	,924	,852	,922	—	84,8	87,8	84,0	... ...	... ...	... ...		N W by W	E S E	S		Cloudy	Th. haze	Clear do.
7	—	,924	,852	,924	—	86,5	86,4	84,4	... ...	... ...	... ...		N W	S S E	S		Haze	Th. haze	Clear th. litng.
8	—	,946	,824	,916	—	86,3	88,2	85,3	... ...	... ...	... ...		S W	S E	S W		Clear	Clear	Cloudy do.
9	—	,936	,828	,910	—	85,4	88,2	84,5	... ...	... ...	2,745		W	E S E	S		Clear	Clear	Fl. cl. do.
10	—	,916	,808	,904	—	86,3	88,5	86,0	... ...	... ...	... ...		S E	S S E	S		Clear	Clear	Haze lightning.
11	—	,908	,810	,924	—	85,8	86,5	85,5	... ...	... ...	... ...		N W	S E	S E		Clear	Th. haze	Fl. cl. do.
12	—	,928	,836	,900	—	87,3	87,5	84,4	... ...	... ...	... ...		N W	W	S		Th. haze	Cloudy	Clear th. litng
13	—	,902	,800	,884	—	86,5	88,5	85,0	... ...	... ...	... ...		N	E	S S W		Clear	Clear	Cloudy do.
14	—	,876	,826	,900	—	85,8	89,5	84,0	... ...	... ...	... ...		S W	E	S		Haze	Cloudy	Cloudy do.
15	—	,864	,796	,874	—	80,2	85,6	84,0	0,300	... ...	... ...		N W	W	S W		Cloudy	Cloudy	Cloudy do.
16	—	,890	—	,884	—	83,4	—	83,8	0,100	... ...	3,171		W	—	S W		Cloudy		Cloudy do.
17	—	,894	29,832	—	—	81,9	83,0	—	... ...	... ...	... ...		W	W	—		Cloudy	Cloudy	— do.
18	—	,872	,788	29,854	—	81,3	84,4	82,9	... ...	... ...	... ...		W	N W	N W		Cloudy	Cloudy	Cloudy do.
19	—	,854	,742	,873	—	81,8	84,3	—	... ...	... ...	... ...		W	N W	N W		Cloudy	Cloudy	— do.
20	---	,845	,732	,866	—	82,0	88,0	85,6	0,287	... ...	... ...		W	S W	S W		Fl. cl.	Fl. cl.	Cloudy do.
21	29,844	,914	,802	—	82,2	84,3	89,0	—	... ...	... ...	... ...	S W	S W by W	S W	—	Clear	Haze	Fl. cl.	— do.
22	,870	,926	,802	29,894	82,2	85,4	89,7	86,8	0,027	... ...	... ...	S W	S W by W	W N W	S W	Haze	Clear	Fl. cl.	Cloudy do.
23	—	,910	,792	,890	—	86,3	90,0	88,0	... ...	... ...	2,692		W	W S W	S W		Haze	Cloudy	Cloudy do.
24	—	,916	,792	,890	—	88,2	91,0	88,0	... ...	... ...	... ...		W	W S W	W		Haze	Cloudy	Haze do.
25	—	,918	,782	,882	—	87,8	90,0	87,8	... ...	... ...	... ...		W	W S W	S W		Haze	Cloudy	Cloudy do.
26	—	,908	,784	—	—	86,5	88,4	—	... ...	... ...	... ...		W	S W	—		Cloudy	Cloudy	— do.
27	—	,870	—	29,842	—	87,5	—	85,9	... ...	... ...	... ...		S W	—	S		Cloudy		Clear do.
28	---	,874	29,764	,854	—	87,7	92,0	84,8	... ...	... ...	... ...		W	S W	S		Clear	Fl. cl.	Clear do.
29	—	,920	,816	,930	—	87,4	92,0	84,5	... ...	... ...	... ...		S W	W S W	S		Clear	Clear	Clear —
30	—	,982	,852	,970	—	87,8	89,0	85,5	... ...	... ...	3,140		S W by W	S S E	S E		Th. haze	Fl. cl,	Cloudy th. litng.
31	—	,976	,824	,920	—	87,3	89,5	86,5	... ...	... ...	... ...		W N W	E S E	S S E		Clear	Cloudy	Cloudy do.
Mean	29,857	29,910	29,809	29,897	82,2	85,3	88,0	85,1											

METEOROLOGICAL REGISTER KEPT AT THE MADRAS OBSERVATORY, FOR THE MONTH OF SEPTEMBER 1837.

Days.	Barometer at 4 A. M.	Barometer at 10 A. M.	Barometer at 4 P. M.	Barometer at 10 P. M.	Thermometer at 4 A. M.	Thermometer at 10 A. M.	Thermometer at 4 P. M.	Thermometer at 10 P. M.	Rain. Sun rise.	Rain. Sun set.	Evaporation.	Direction of Wind. 4 A. M.	Direction of Wind. 10 A. M.	Direction of Wind. 4 P. M.	Direction of Wind. 10 P. M.	Weather. 4 A. M.	Weather. 10 A. M.	Weather. 4 P. M.	Weather. 10 P. M.
1837	Inch.	Inch.	Inch.	Inch.	°	°	°	°	In.	In.	In.								
Sep. 1	—	29,900	29,804	29,854	—	87,4	89,7	87,3	... ...	... ...	... ...		W	S E	S		Cloudy	Cloudy	Cloudy lightning.
2	—	,908	,812	,893	—	86,6	91,0	85,2	... ...	... ...	... ...		swbyw	S W	S E		Haze	Th. haze	Rainy do.
3	—	,981	,852	,950	—	86,2	89,0	86,2	0,075	... ...	... ...		W	S W	S		Th. haze	Th. haze	Haze do.
4	—	,968	,826	—	—	87,0	91,5	—	... ...	... ...	... ...		S W	S W	—		Clear	Cloudy	—
5	—	,926	,812	29,944	—	86,4	90,0	87,1	0,027	... ...	... ...		N W	E S E	W N W		Th. haze	Cloudy	Cloudy do.
6	—	,926	,808	,894	—	85,3	91,5	85,6	0,005	... ...	3,265		Nwbyw	W S W	S E		Th. haze	Cloudy	Cloudy do.
7	—	,934	—	,890	—	86,3	—	84,2	0,127	0,248	... ...		W	—	S W		Th. haze	—	Cloudy do.
8	—	,928	—	,916	—	85,7	—	84,1	......	... ...	... ...		S W	—	S		Th. haze	—	Cloudy do. & th.
9	—	,920	29,802	,886	—	83,9	90,0	82,8	0,652	... ...	... ...		W	N W	S		Cloudy	Fl. cl.	Fl. cl. do.
10	—	—	,806	,896	—	—	87,0	84,4	... ...	... ...	... ...		—	S S E	S		—	Cloudy	Cloudy do.
11	—	29,920	,824	,928	—	85,2	88,0	85,9	... ...	... ...	... ...		S S W	S S E	S		Clear	Clear	Cloudy do.
12	—	,950	,852	,940	—	85,8	88,0	84,2	... ...	... ...	... ...		W	S S E	S W		Clear	Clear	Fl. cl. do.
13	—	,99[illegible]	,884	,978	—	86,2	88,0	83,8	... ...	... ...	3,578		S W	S E	S E		Clear	Clear	Clear do.
14	—	30,030	,882	,972	—	85,8	87,4	82,3	0,412	... ...	... ...		S W	S S E	S		Fl. cl.	Clear	Clear do.
15	—	,030	,880	,990	—	85,0	87,0	82,5	... ...	... ...	... ...		S W	S S E	S		Fl. cl.	Clear	Fl. cl. —
16	—	,028	,890	,956	—	84,4	86,0	82,3	... ...	... ...	... ...		S E	S S E	S		Fl. cl.	Clear	Clear
17	—	29,980	,862	,976	—	85,0	86,0	82,2	... ...	... ...	... ...		S E	S E	S		Fl. cl.	Clear	Clear lightning.
18	—	30,000	—	,984	—	84,6	—	82,9	... ...	... ...	... ...		S W	—	S		Fl. cl.	—	Clear do.
19	29,940	,028	29,880	—	79,9	85,2	87,0	—	... ...	... ...	... ...	N W	S	S E	—	Fl. cl.	Fl. cl.	Clear	— do.
20	29,920	29,992	,866	29,970	80,0	83,5	86,4	83,2	... ...	... ...	3,203	S W	E	S E	S E	Fl. cl.	Fl. cl.	Clear	Clear do.
21	—	30,006	,882	,980	—	84,2	86,0	83,7	... ...	... ...	... ...		S E	S E	S		Fl. cl.	Clear	Clear do.
22	—	,030	,924	30,012	—	84,7	87,0	82,6	... ...	... ...	... ...		S E	S E	S E		Fl. cl.	Fl. cl.	Clear do.
23	—	,032	,920	29,998	—	85,8	87,0	83,9	... ...	... ...	... ...		E	E S E	S		Fl. cl.	Clear	Clear do.
24	—	,020	—	,980	—	85,2	—	84,0	0,100	... ...	... ...		E	—	S		Fl. cl.	—	Clear do.
25	—	,000	29,880	,960	—	85,8	85,6	83,8	... ...	... ...	... ...		S E	S E	S E		Fl. cl.	Cloudy	Clear do.
26	29,912	29,982	,856	,964	82,0	86,2	87,5	84,3	... ...	... ...	... ...	S E	S W	E	S E	Clear	Fl. cl.	Haze	Clear do.
27	—	30,018	,900	30,010	—	86,4	88,0	84,3	... ...	... ...	2,912		S Ebys	E S E	S E		Fl. cl.	Clear	Clear do.
28	—	,016	,904	—	—	86,3	87,5	—	... ...	... ...	... ...		E	E S E	—		Fl. cl.	Th. haze	— do.
29	—	29,976	,908	—	—	84,6	8[illegible],0	—	... ...	0,287	... ...		N E	E S E	—		Cloudy	Cloudy	— do.
30	—	,972	,890	29,944	—	82,9	83,0	82,5	... ...	1,864	... ...		W	E	S E		Rain.	Th. haze	Cloudy do. heavy dew.
Mean	29,924	29,979	29,863	29,949	80,6	85,4	87,7	84,0											